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AD/A-006 518

EFFECT OF YAW ANGLE ON STEERING
FORCES FOR THE LUNAR ROVING VEHICLE
WHEEL

Andrew J. Green

Army Engineer Waterways Experiment
Station

Prepared for:

National Aeronautics and Space Administration

October 1971

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TECHNICAL REPORT M-71-7

EFFECT OF YAW ANGLE ON STEERING FORCES FOR THE LUNAR ROVING VEHICLE WHEEL

by

A. J. Green



October 1971

Sponsored by **National Aeronautics and Space Administration**

Conducted by **U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi**

ARMY-MRC VICKSBURG, MISS.

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AD/A006518

DOCUMENT CONTROL DATA - R & D		
(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)		
1. ORIGINATING ACTIVITY (Corporate author) U. S. Army Engineer Waterways Experiment Station Vicksburg, Mississippi		2a. REPORT SECURITY CLASSIFICATION Unclassified 2b. GROUP
3. REPORT TITLE EFFECT OF YAW ANGLE ON STEERING FORCES FOR THE LUNAR ROVING VEHICLE WHEEL		
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Final report		
5. AUTHOR(S) (First name, middle initial, last name) Andrew J. Green		
6. REPORT DATE October 1971	7a. TOTAL NO. OF PAGES 59 63	7b. NO. OF REFS 1
8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S) Technical Report M-71-7	
b. PROJECT NO.	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
c.		
d.		
10. DISTRIBUTION STATEMENT Approved for public release; distribution unlimited.		
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY National Aeronautics and Space Administration Washington, D. C.
13. ABSTRACT A series of tests was conducted with a Lunar Roving Vehicle (LRV) wheel operating at yaw angles ranging from -5 to +90 deg. The load was varied from 42 to 82 lb (187 to 365 N), and the speed was varied from 3.5 to 10.0 ft/sec (1.07 to 3.05 m/sec). It was noted that speed had an effect on side thrust and rut depth. Side thrust, rut depth, and skid generally increased as the yaw angle increased. For the range of loads used, the effect of load on performance was not significant. Reproduced by NATIONAL TECHNICAL INFORMATION SERVICE U.S. Department of Commerce Springfield, VA. 22151		

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FOREWORD

The study reported herein was conducted by personnel of the Mobility Research Branch (MRB), Mobility and Environmental (M&E) Division, U. S. Army Engineer Waterways Experiment Station (WES). The study was sponsored by the Lunar Exploration Office, National Aeronautics and Space Administration, Washington, D. C., and it was under the technical cognizance of Mr. Fritz Kramer of the Astronautics Laboratory, George C. Marshall Space Flight Center, Huntsville, Alabama. The work was performed under NASA - Defense Purchase Request No. H-76596A dated 17 November 1970.

The tests were conducted under the general supervision of Messrs. W. G. Shockley and S. J. Knight, Chief and Assistant Chief, respectively, of the M&E Division; and under the direct supervision of Mr. A. J. Green of the Research Projects Group, MRB. This report was prepared by Mr. Green.

Acknowledgment is made to Dr. D. R. Freitag, Assistant Technical Director, WES, and Mr. J. L. Smith, MRB, for their advice and assistance during this study.

COL Ernest D. Peixotto, CE, was Director of WES during the conduct of this study and preparation of this report. Mr. F. R. Brown was Technical Director.

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SUMMARY

A series of tests was conducted with a Lunar Roving Vehicle (LRV) wheel operating at yaw angles ranging from -5 to +90 deg. The load was varied from 42 to 82 lb (187 to 365 N), and the speed was varied from 3.5 to 10.0 ft/sec (1.07 to 3.05 m/sec). It was noted that speed had an effect on side thrust and rut depth. Side thrust, rut depth, and skid generally increased as the yaw angle increased. For the range of loads used, the effect of load on performance was not significant.

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EFFECT OF YAW ANGLE ON STEERING FORCES FOR
THE LUNAR ROVING VEHICLE WHEEL

PART I: INTRODUCTION

Purpose

1. At the request of the Astronautics Laboratory of the National Aeronautics and Space Administration (NASA) Marshall Space Flight Center, tests were conducted at the U. S. Army Engineer Waterways Experiment Station (WES) to determine experimentally the magnitude of the cornering forces generated by the Lunar Roving Vehicle (LRV) wheel when it was operating in a lunar soil simulant.* These tests were necessary because very little information is available in the literature, and the information that is available does not cover the entire range of yaw angles or the light loads of the LRV program.

Scope

2. The 50 percent chevron-covered General Motors (GM) wheel was used to conduct towed single-wheel tests in the lunar soil simulant. The yaw angle of the wheel was varied from -5 to +90 deg, i.e. for the 90-deg yaw angle tests, the plane of the wheel was perpendicular to the axis of advance of the wheel. Tests were conducted at three different wheel loads and velocities. The following tabulation is a summary of the test conditions.

* Crushed basalt with approximately the same grain-size distribution as that of soils taken from the lunar surface.

	Design Velocity, ft/sec(m/sec)				
	4.5(1.37)		6.5(1.98)		8.5(2.58)
	Load, lb(N)				
<u>Yaw Angle</u> <u>deg</u>	<u>42(187)</u>	<u>62(276)</u>	<u>82(365)</u>	<u>62(276)</u>	<u>62(276)</u>
-5	-	X	-	-	-
0	-	-	-	-	-
+5	X	X	X	X	X
+10	X	X	X	X	X
+15	-	X*	-	-	-
+25	X*	X	X	X	X
+40	-	X	-	-	-
+65	X	-	-	-	-
+85	X	-	-	-	-
+90	X	-	-	-	-

*Duplicate.

In addition to the above, tests were conducted at speeds of 3.5 and 10.5 ft/sec (1.07 and 3.05 m/sec) and at 57-lb (253-N) load at 0-deg yaw angle.

3. This program is regarded as an initial effort. It is anticipated that more detailed testing will be formulated after the data obtained herein have been thoroughly reviewed at the Astronautics Laboratory.

PART II: SOIL AND TEST EQUIPMENT

Soil

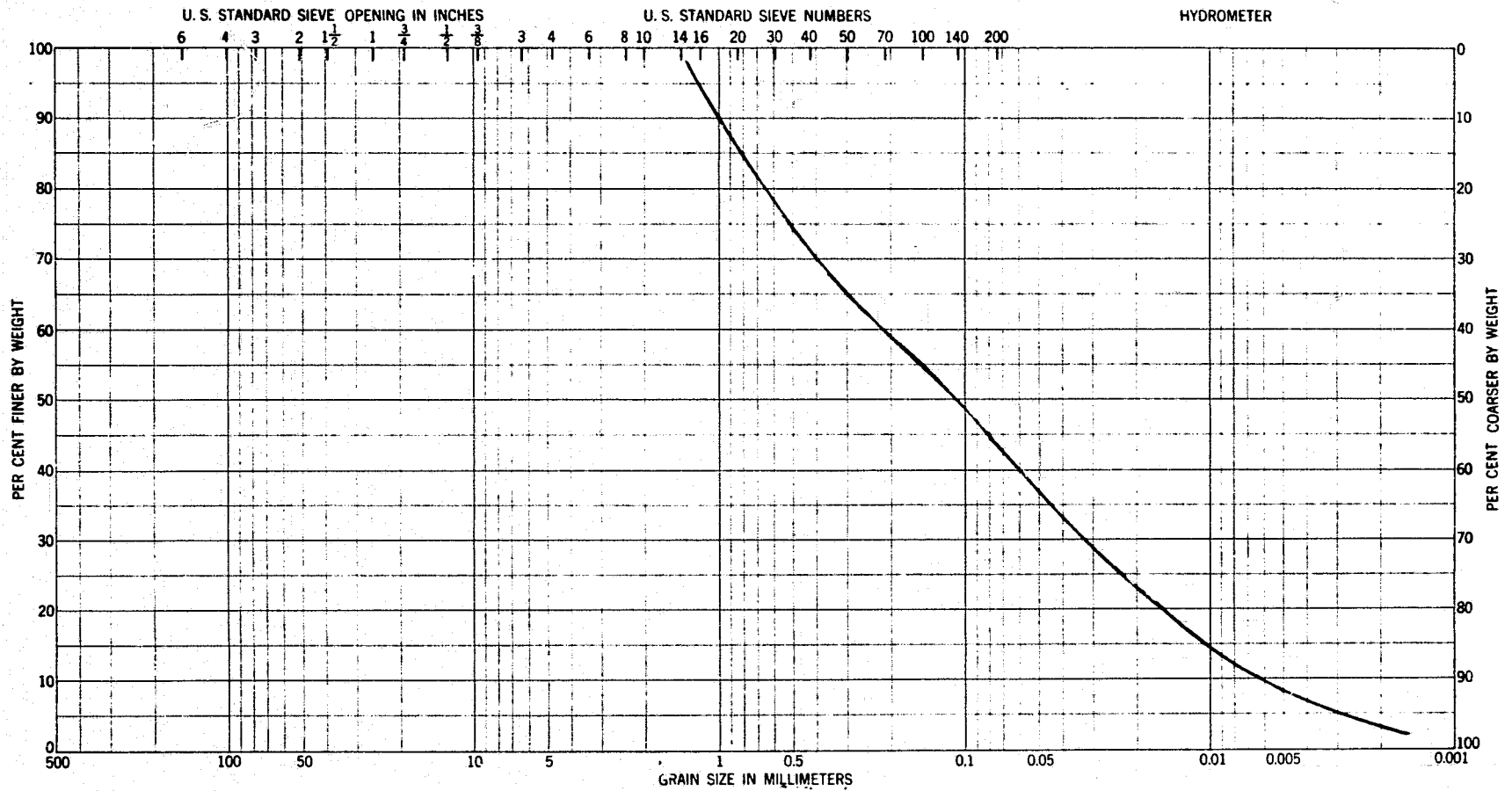
Description

4. The test soil was a crushed basalt purchased from the Basalt Rock Company, Napa, California, and reprocessed to produce a grain-size distribution approximating that of the samples collected during the Apollo flights. Gradation, classification, density, and void ratio data are given in fig. 1. This soil is more-or-less cohesionless, but it exhibits a small amount of cohesion when moist and/or compacted. The soil condition deemed most appropriate for this program was that defined as LSS_4 in earlier studies.* The engineering properties of this material are as follows: penetration resistance gradient $G = 3.71$ pci (0.98 MN/m^3); dry density $\gamma_D = 95.14$ pcf (1.524 g/cm^3); moisture content $w = 1.8$ percent; friction angle $\phi = 38.5$ deg; and cohesion $c_{tr} = 0.1$ psi (0.76 kN/m^2).

Preparation

5. To prepare the moist basalt (LSS_4), a sufficient quantity of water was added to the material to attain a moisture content of 1.8 percent. The material was then thoroughly mixed in the test bin. To maintain the moisture content as near constant as practical, the test section was covered with an impervious membrane when not in use, and the surface was sprayed very lightly with water at frequent intervals to compensate for evaporation. Before each test, the soil was plowed to a depth of 12 in. (30 cm), and compaction was then applied by dragging

* A. J. Green and K.-J. Melzer, "Performance of Boeing-GM Wheels in a Lunar Soil Simulant (Basalt)," Technical Report No. M-70-15, Oct 1970, U. S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Miss.



a vibrating plate over the surface of the material. Following this, the surface was screeded level.

6. Since penetration resistance can be related to the other engineering properties of a material, and thus is an expedient means of determining soil properties, it has been used for quality control in this and other wheel performance studies. During the testing cycles, penetration resistance and moisture content were determined frequently, and density was determined occasionally to ensure that the test section had the desired engineering properties at the time of testing.

Test Equipment

Test wheel

7. The wheel used in this program is shown in fig. 2; its load-deflection characteristics are listed in table 1.

Test facility

8. The mesh-wheel tests were conducted in the small-wheel test facility at the WES. This facility consists of an overhead guide track, soil cars, floor tracks, soil processing equipment, and a soil test penetrometer. Riding on the overhead track is a test carriage that is driven by a 30-hp variable-speed drive system. Mounted on the carriage is a dynamometer system.

Dynamometer system

9. The dynamometer system shown in fig. 2 was constructed especially for this program, and it approximates the suspension mechanism on the LRV. The system was instrumented to provide measures of the horizontal force in the plane of the wheel (pull), the horizontal force perpendicular to

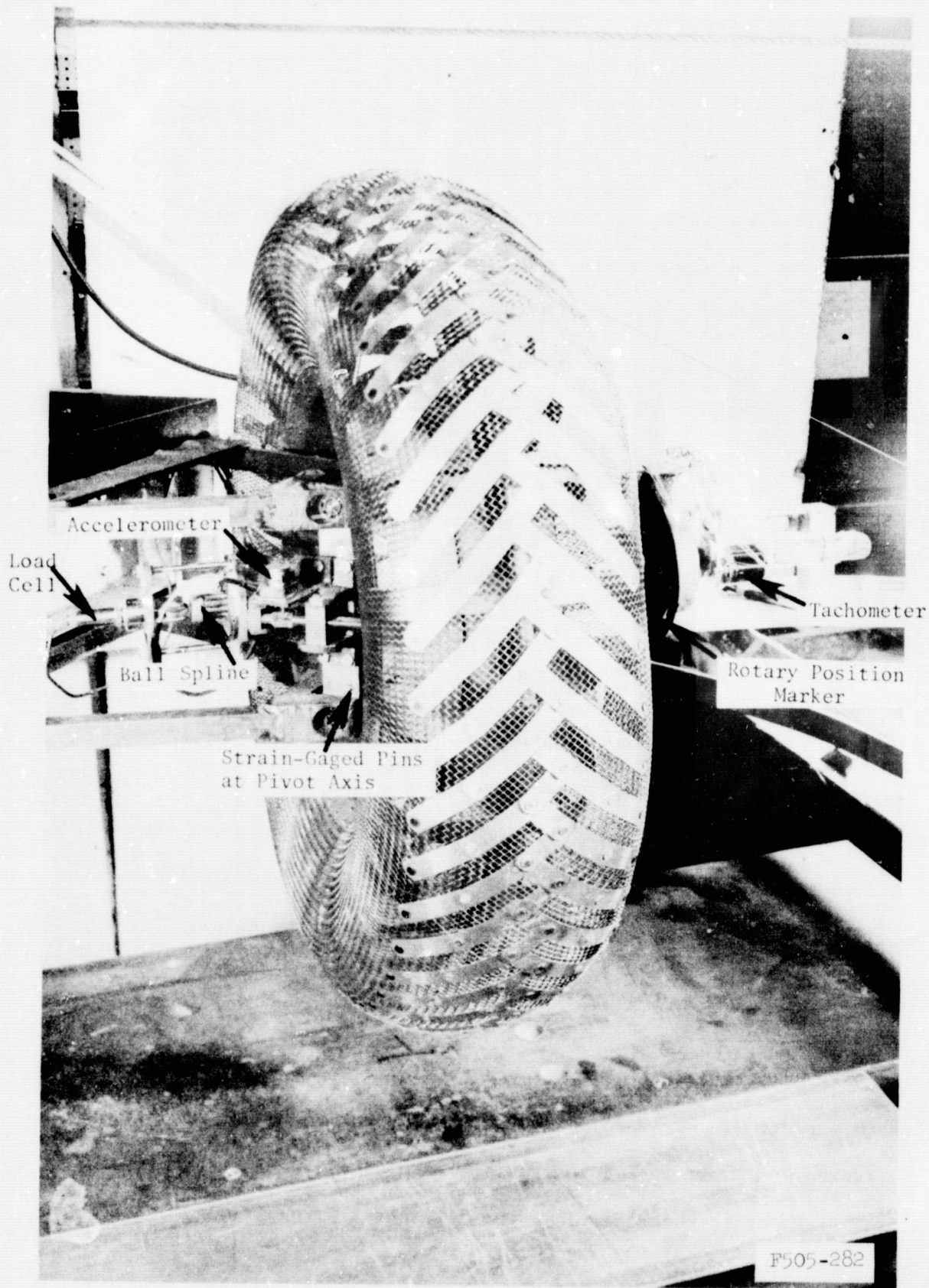


Fig. 2. Wheel and dynamometer system

the plane of rotation (side thrust), the vertical load, hub displacement (sinkage), rotational speed of the wheel, and translational velocity of the system. The design of the system was based on requirements to guide the wheel in a prescribed course, maintain a wheel load from 0 to 100 lb (444.8 N), permit adjustable steering angle from -5 to +90 deg, and allow up to 4 in. (10.16 cm) of sinkage. Additional factors considered desirable, but of secondary importance, were that (a) the suspension system geometry function in a manner similar to that of the actual LRV, and (b) provisions be incorporated for powering the wheel for future tests. Some unexpected problems arose during the construction and installation of the dynamometer system, which delayed the start of the actual testing program. The delay resulted in a decrease in the amount of funds available for performance testing.

10. Measurements. The primary measurement required was side thrust at all steering angles and test conditions. Related control and measurement functions are listed below:

- a. Control longitudinal wheel speed.
- b. Control longitudinal wheel path.
- c. Maintain sinkage reference plane.
- d. Control vertical force on wheel.
- e. Control yaw angle of wheel.
- f. Measure longitudinal wheel speed.
- g. Measure longitudinal wheel position.
- h. Measure sinkage of wheel.
- i. Measure vertical acceleration of wheel.

- j. Measure angular wheel speed.
- k. Measure angular wheel position.
- l. Measure horizontal pull on wheel.
- m. Measure horizontal acceleration of wheel.

11. Operation. Operation of the dynamometer will be explained with reference to fig. 2 and to the simplified sketch in fig. 3. The side thrust S on the wheel was transferred from the wheel hub to the ball spline, which, in turn, was restrained by a force sensor (Statham Model UC3). The ball spline was a low-friction device that permitted free linear motion, but prevented rotary motion. The characteristics of the ball spline and the mounting of the force sensor ensured that the sensor was subjected to side thrust only.

12. The longitudinal or translational velocity of the wheel under test was sensed by a tachometer mounted on the drive carriage. Longitudinal position of the wheel axle was derived from slots in plates mounted on the carriage guide track structure. Slot position was sensed by a photocell. Position pulses were transmitted for each 3.9 in. (10 cm) of travel ± 0.04 in. (1 mm).

13. The vertical displacement of the wheel hub (sinkage) was measured by a potentiometer coupled to the sinkage frame by a fine wire. Force exerted by this mechanism was a few ounces, and thus negligible in its effect on the vertical wheel force.

14. Vertical force on the wheel was controlled by the number and position of counterweights used. The force exerted by the wheel on the soil was checked during the positioning of the counterweights by supporting the wheel on a platform scale. Once the counterweights were

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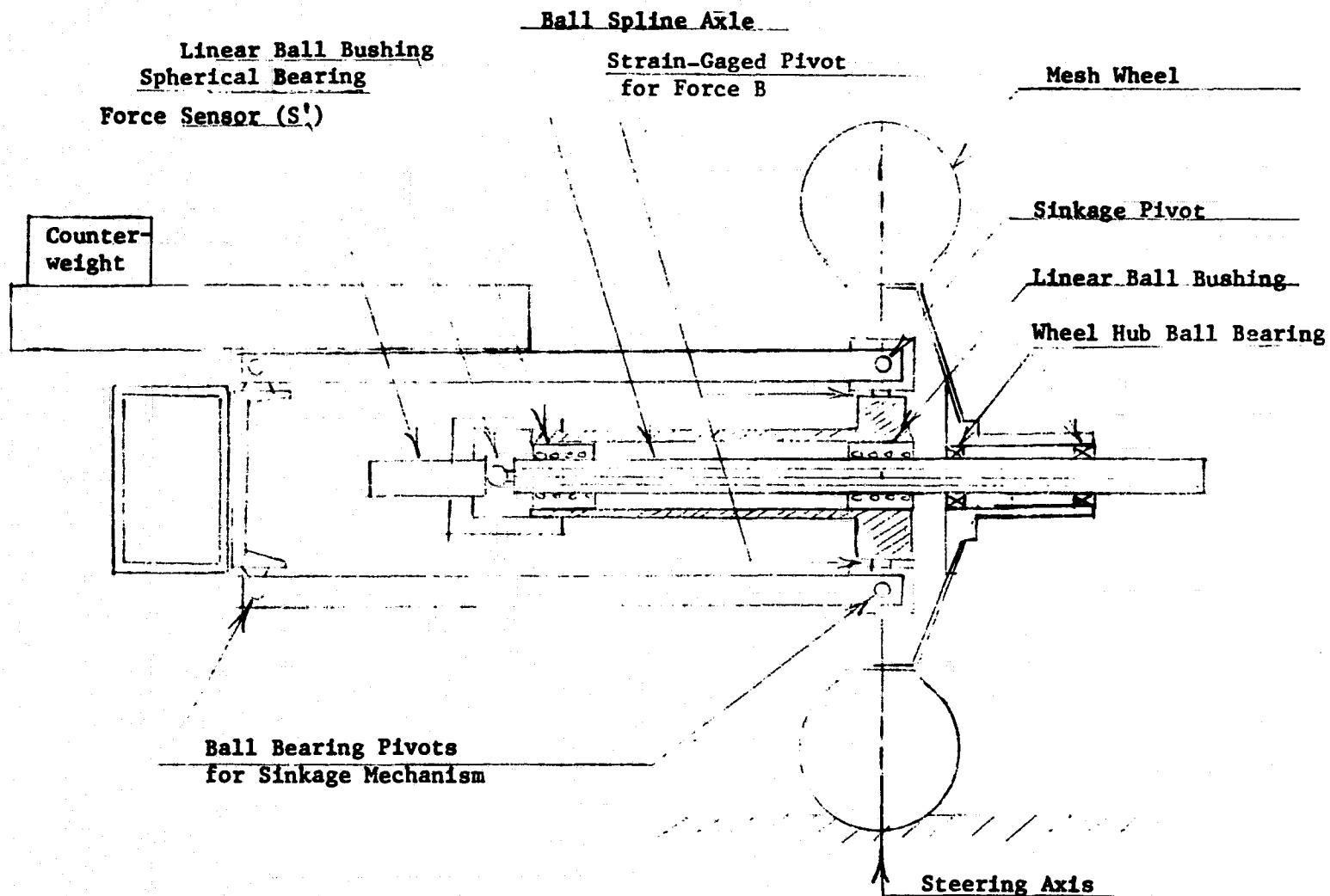


Fig. 3. Side-thrust measurement on mesh wheel

set, the wheel vertical force was fixed at a preselected value, except for dynamic effects. Deviations from the prescribed load value during a test were sensed by an accelerometer mounted near the center of rotation of the wheel.

15. Yaw angle for each test was set by a manually adjusted screw for angles from -5 to +40 deg. For steering angles of +45 to +90 deg, an offset fixture was installed between the dynamometer and the main carriage. This offset fixture added a fixed increment of 45 deg to the steering angle.

16. The angular position of the wheel during a test run was sensed by a slotted disc and photocell mechanism mounted on the wheel hub and axle. The angular velocity of the wheel was sensed by a tachometer mounted in conjunction with the slotted disk and photocells. Signal wires from the tachometer and photocells were run from the mounting point through an unused groove in the ball spline to a cable termination point on the sinkage linkage.

17. Horizontal force B (pull) on the test wheel was sensed by strain gages bonded to the steering pivot posts.

18. Deficiencies. The mesh-wheel dynamometer system met the control requirements but was deficient in several aspects of the measurements. Specific deficiencies and suggested improvements that could be incorporated for future tests include the following:

- a. The system performed very well initially in measuring side thrust, but this performance deteriorated with time possibly because of dust settlement on the ball spline shaft. Improved dust covers over the free ends of the spline would prevent this deterioration.

- b. Wheel pull values were mixed with values of other forces and moments at the pivot axis area, and this made interpretation of the results difficult. It is suggested that, instead of attempting to resolve wheel pull at this location, the force be measured in the line of travel at the points of attachment of the sinkage mechanism to the main carriage. The wheel pull could then be computed from the line of travel force, side force, and yaw angle.

Recording systems

19. The general measurement system is shown in block diagram form in fig. 4. Signals from the transducers were carried over cables to signal conditioning equipment located in the instrumentation rooms. Signals were then recorded on a direct-writing light-beam oscillograph, an analog magnetic tape recorder, or a digital data acquisition system. Maintenance problems with the digital data acquisition system during the time of the test program forced the use of the analog magnetic tape recorder as the primary data source, and the records were later digitized off-line.

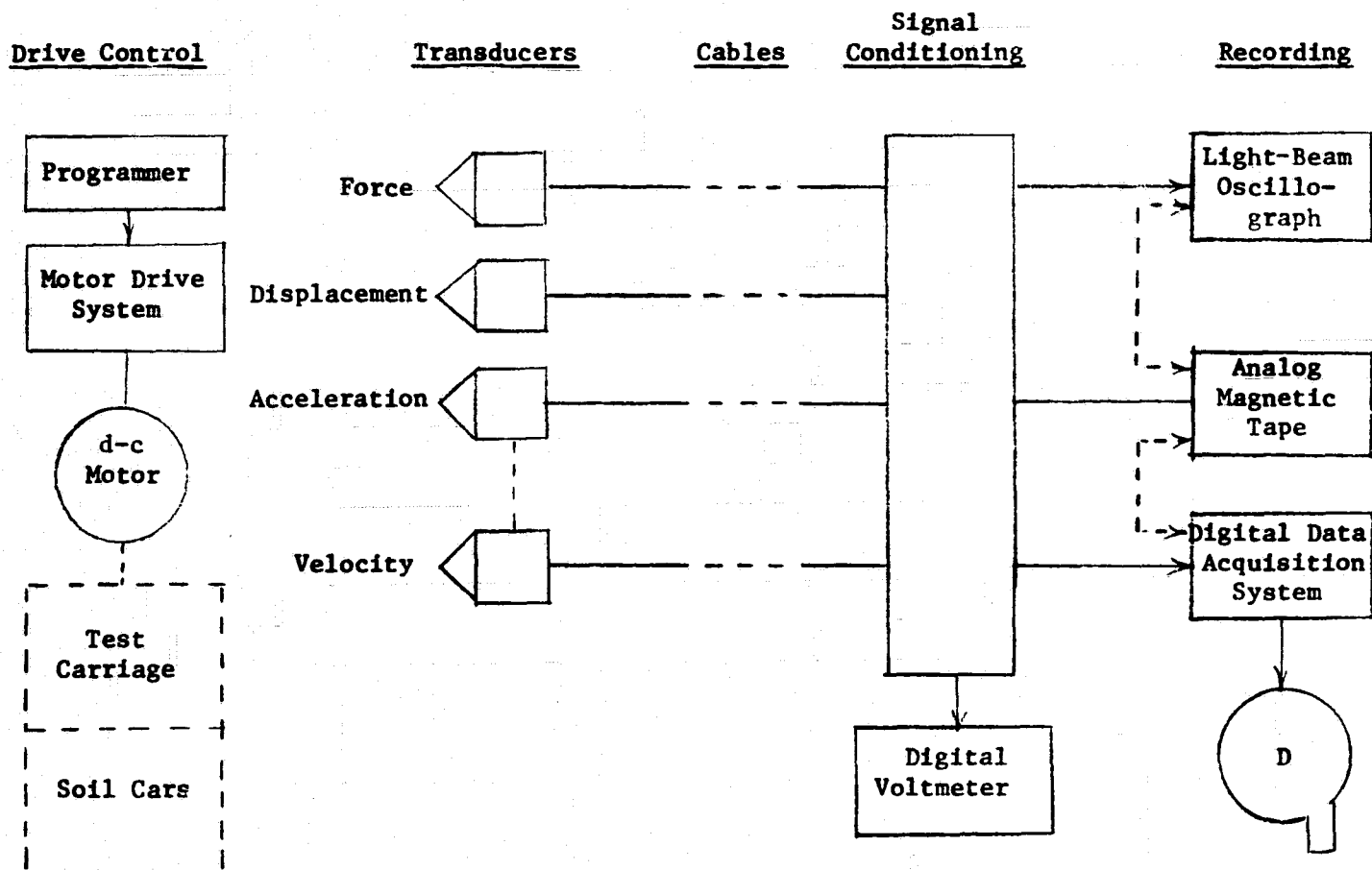


Fig. 4. Measurement and control system for mesh-wheel tests

PART III: TEST PROCEDURES

Calibrations

Transducer calibration

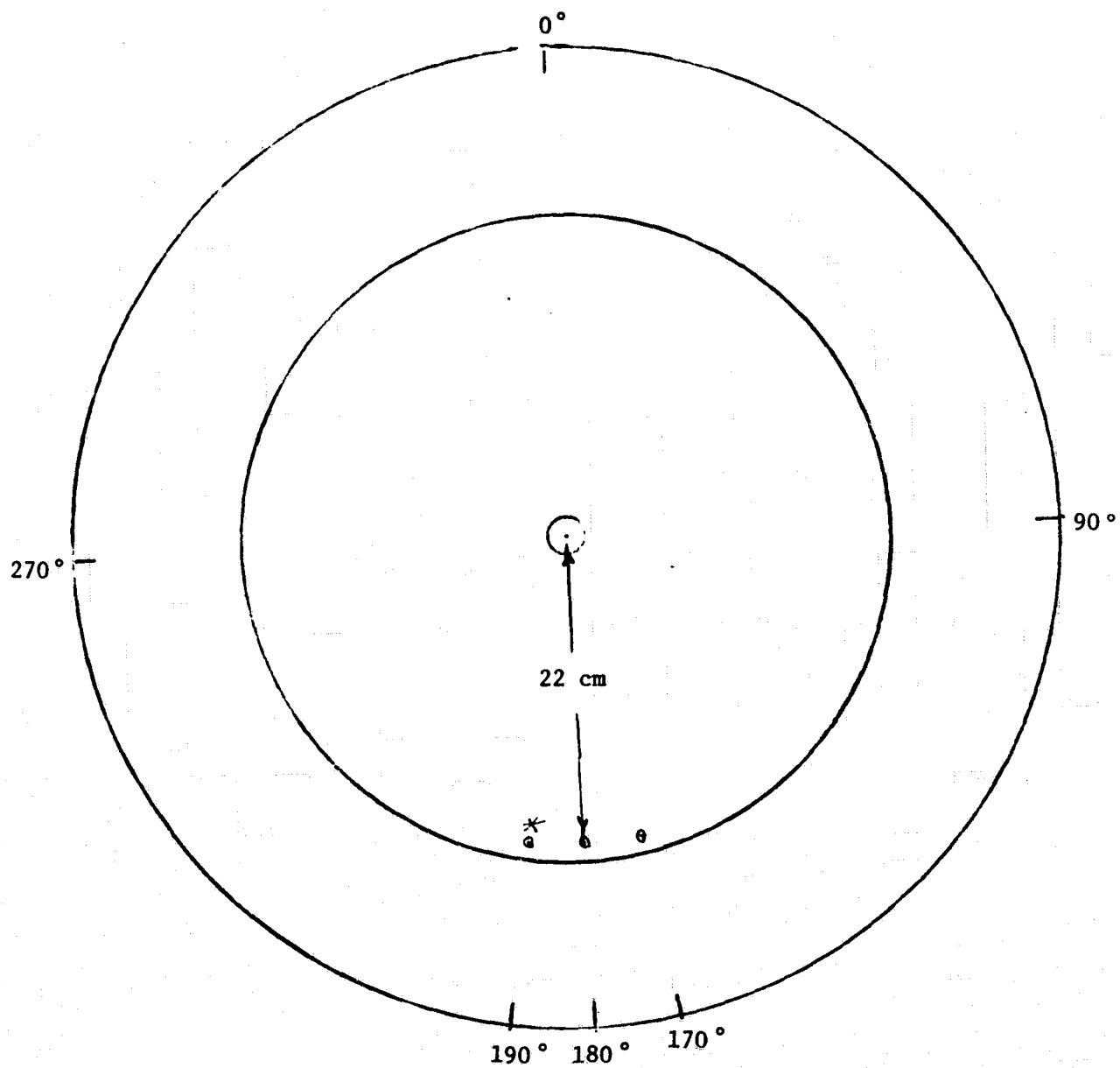
20. Commercial force cells and strain-gaged transducers fabricated at the WES were initially calibrated by using deadweights. The factory calibration of the accelerometer used was checked by inverting the instrument (i.e. a 2-g turnover).

In-place calibrations

21. After the dynamometer system was assembled, all transducers, extensimeters (for measuring displacements), and tachometers were calibrated. Forces were checked with a force cell used to apply load at various positions on the wheel and rim. Sinkage or tilt was checked by raising or lowering the test wheel a measured amount as indicated on an engineer's scale. Tachometers were checked against distance and time as given by the photoelectric cell interrupts and oscillograph timing lines. Such calibrations usually are performed prior to and at the end of each major test group, and, as such, are referred to as "end-to-end" calibrations.

Side-thrust calibration

22. Side thrust is the horizontal force S perpendicular to the plane of the wheel. To calibrate this thrust, a force was applied to the rim of the wheel at several radial points, as shown in fig. 5. In the initial calibration, the only radial position used was directly beneath the axle, and calibrations were conducted at only the 0-deg



*Force applied to the rim
≈ 22 cm from the center of
the wheel.

Fig. 5. Calibration for side-thrust position.

yaw angle position. The calibration indicated that the measured side-thrust force averaged 3 percent less than the applied. This deviation was assumed to be due to the friction along the ball spline shaft that transferred force to the load cell. In the final calibration, a load was applied to the rim at six positions with the wheel at various yaw angles up to 45 deg. These six were 0, 90, 170, 180, 190, and 270 deg. In actual operation, the applied force should lie between 170 and 190 deg; therefore, an evaluation of system accuracy should be based on information obtained from calibrations made only at these points (see fig. 5). The measured side-thrust force averaged 8.5 percent less than the applied. A possible explanation of this deviation is that dust had settled on the ball spline shaft. It is postulated that these deviations between measured and applied forces for static conditions may represent the maximum that can occur, i.e. in the dynamic state, deviations caused by friction forces may be much less. For this reason, no attempt was made to use calibration data to adjust the recorded side-thrust measurements. True simulation of the dynamic state would have been a difficult, if not impossible, task to accomplish.

Pull calibration

23. Pull is the horizontal force B in the plane of the wheel; and since the wheel was operated only in the towed condition, this force was considered to be negative. The transducer reflecting this measurement was a strain-gaged thin section at the "kingpin" (the wheel's center of pivot and rotation) (see figs. 2 and 3). No deviations were noted between measured and applied forces when a force was applied in the plane of the wheel. However, since "mechanical cross talk" is often

a problem with this type of system, it was evaluated during calibration. To determine the magnitude of the cross talk, a force was applied perpendicular to the plane of the wheel at two different offsets from the axle and at up to six different radial positions. This calibration sequence was repeated at yaw angle positions of 0, 5, 10, 15, 25, and 40 deg. The calibration revealed that the cross talk was not sensitive to yaw angle position, but was very sensitive to the radial position at which the side thrust was applied. In the calibration, the radial position of the applied thrust was varied from 90 to 270 deg. The percentage of cross talk plotted as a function of the angle resembled a sine wave and crossed the abscissa near 180 deg. The percentage of cross talk could be approximated by a linear relation from 170 to 190 deg,* as shown in fig. 6. From visual observation of the tests, it appeared that the line of action of the side thrust was directly beneath the axle. Therefore, the force in the plane of the wheel was corrected as shown in the following example:

Measured B = -10 newtons

Measured S = 110 newtons

Read on fig. 6, 5 percent of S is registered as B at 180 deg.

$B_c \text{ (corrected)} = B - (0.05) (S)$

$B_c = -10 - 5.5$

$B_c = -15.5 \text{ newtons}$

Operational Procedures

24. The carriage was accelerated to the desired speed while traveling

*Refer to paragraph 22 for explanation of choice of 170 to 190 deg.

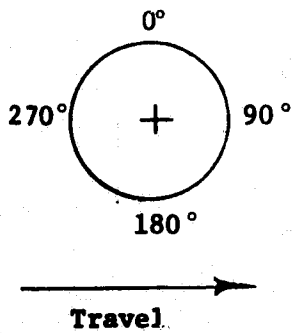
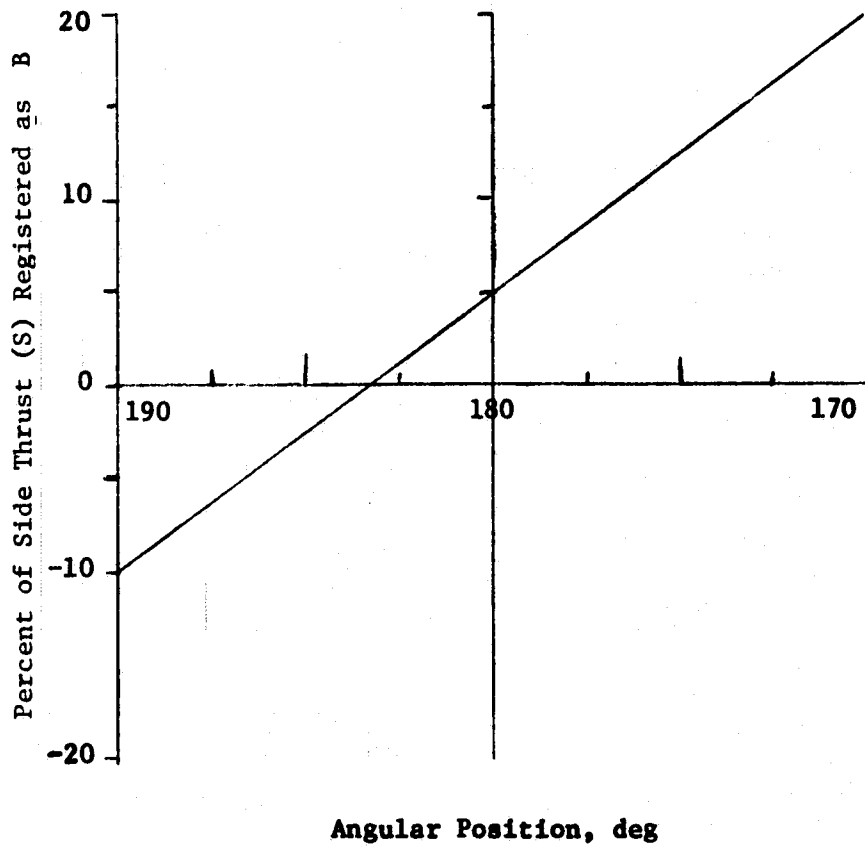


Fig. 6. Calibration for cross talk on side thrust S on pull (motion resistance) B

in an approach lane that was surfaced with a plastic-coated plywood. (Plywood was used in the approach lane to reduce the force on the wheel to a minimum before it reached the test lane and to eliminate the use of a second soil in the approach lane. If a second soil had been used, the wheel would have carried it forward and contaminated the LSS.) Once the desired velocity was attained, it was maintained as near constant as possible by the carriage servo-controlled speed system. Table 2 contains the statistical averages and standard deviations for the information shown in table 3. Table 3 contains a detailed computer listing of the parameters V_w , V_c , W , B , and S for tests 21, 22, 25, 26, and 30-48. The data are divided into three segments representing the approach, the test lane, and the overrun. The first one half to two thirds of the approach was on plastic-coated plywood surface and the remainder was a steady-state condition. The test lane represented a near steady-state condition and an area where the soil had the desired consistency. During the overrun the wheel was traveling on LSS of an unknown consistency.

Sign Conventions

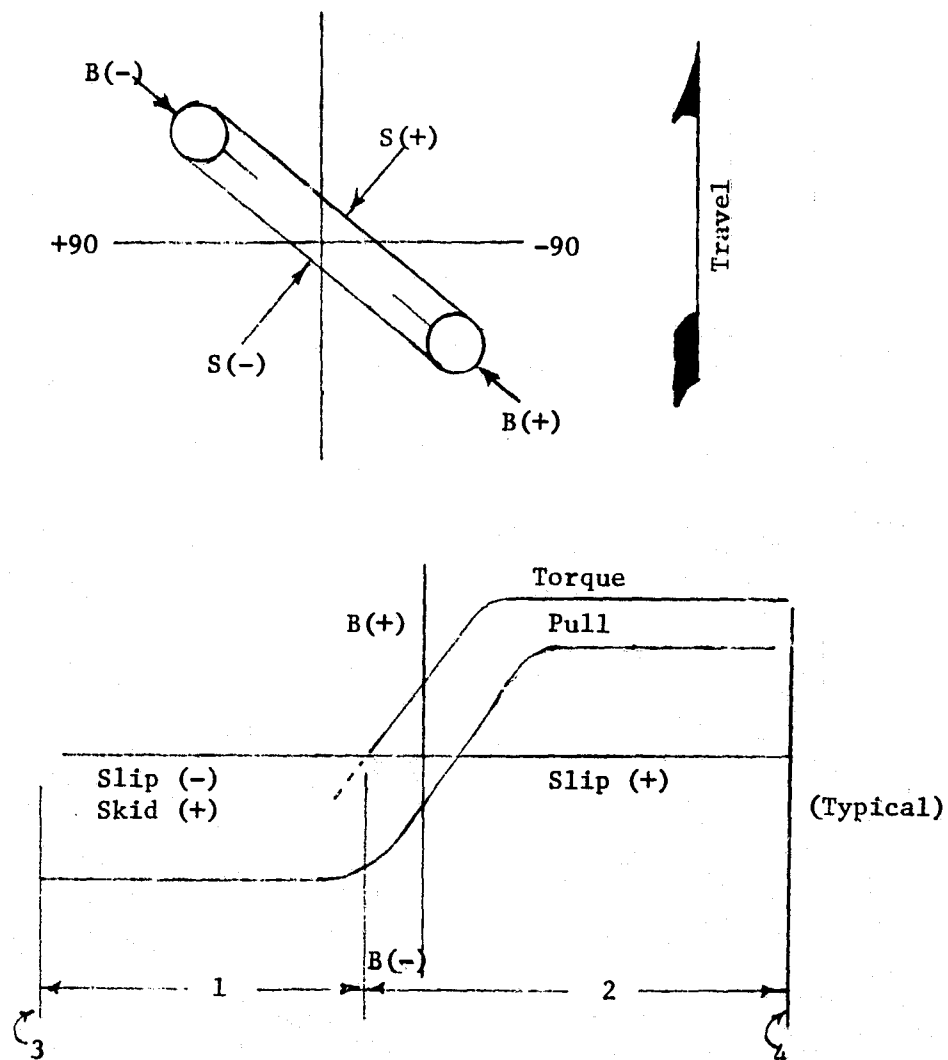
25. The sign conventions for yaw angle, side thrust, pull, sinkage, and slip and skid are given in fig. 7. In this study the slippage between the wheel and the surface is referred to as skid and is defined as follows:

$$\text{skid} = S = \left(\frac{V_w - V_c}{V_c} \right) 100 = \left(\frac{V_w}{V_c} - 1 \right) 100$$

where

V_w = rotational speed of the wheel

V_c = translational speed of the carriage



LEGEND

- 1 Braked- or towed-wheel range
- 2 Powered-wheel range (not included in program)
- 3 Nonrotating wheel (full skid)
Slip = $-\infty$; Skid = 100%
- 4 Spinning wheel (stationary)
Slip = 100%

Fig. 7. Sign conventions

PART IV: TEST RESULTS

26. The principal control parameters for this program were speed, wheel load, and yaw angle. Soil conditions were approximately the same for each test. The effect that variation of these control parameters had on performance is described in the following paragraphs. Rut depth, skid, pull, and side thrust are the significant dependent performance parameters that were measured or computed from test results.

27. Wheel performance data are shown in tables 2 and 3. Table 2 also contains the corrected pull data, measured rut depth data, and the computed values of skid, pull coefficient, and side-thrust coefficient. The statistical averages shown in table 2 represent the average of the data from the test lane itself [17.4 ft (5.3 m) long]. Each data line shown in table 3 is 3.9 in. (10 cm) from its neighbor with respect to the test lane. The 1st to approximately the 50th data lines shown represent the performance on the plastic-coated plywood surface. No statistical summary nor data plots were made using these data. They are included in this report for information only, as requested by the Astronautics Laboratory. The wheel traveled approximately 3.3 ft (1 m) in the LSS before actually reaching the area referred to as "test lane."

Effect of Speed on Performance

28. The effect of varying carriage speed was examined at yaw angles of 0, 5, 10, and 25 deg. The wheel load for this group of tests was 62 lb (276 N), except for the 0-deg yaw angle tests; these were conducted at a load of 57 lb (253 N). The side-thrust coefficient and

sinkage decreased with speed for all yaw angles greater than zero, as shown in fig. 8. For the 0-deg yaw angle, the side thrust was negligible, and there was no significant change in sinkage with speed. The pull coefficient was not affected by speed in a consistent fashion. The information for the 0-deg angle tests is corroborated by data obtained with this wheel mounted in a different dynamometer system and run at speeds ranging from 2.5 to 10.9 ft/sec (0.75 to 3.3 m/sec).*

Effect of Wheel Load on Performance

29. The effect of wheel load on performance was examined at yaw angles of 5, 10, and 25 deg (fig. 9). The nominal speed for this group of tests was 4.5 ft/sec (1.37 m/sec). Pull coefficient decreased with load increase for 5- and 10-deg yaw angles. For the 25-deg angles, the pull coefficient generally increased with load. Side-thrust coefficient and sinkage tended to increase as the yaw angle, but did not exhibit a consistent trend with respect to load.

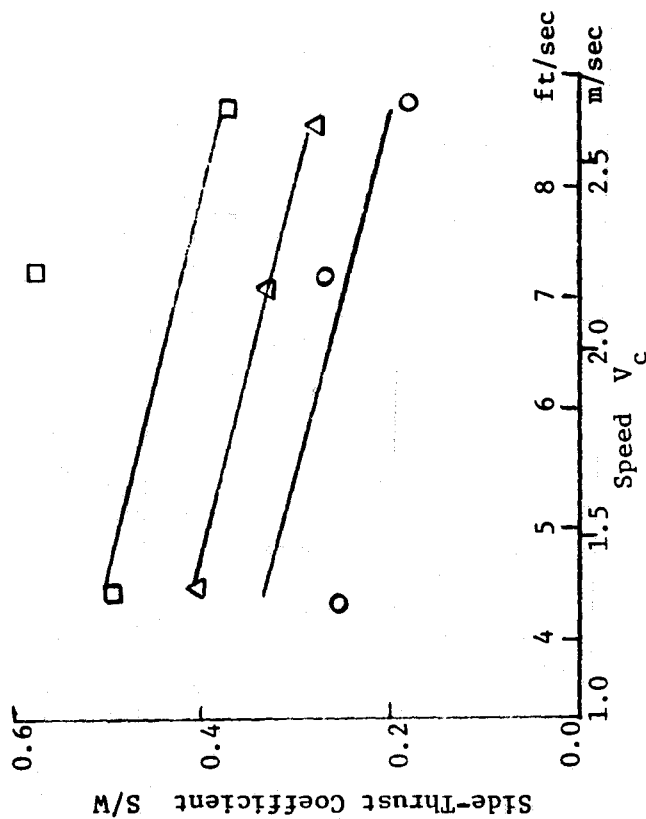
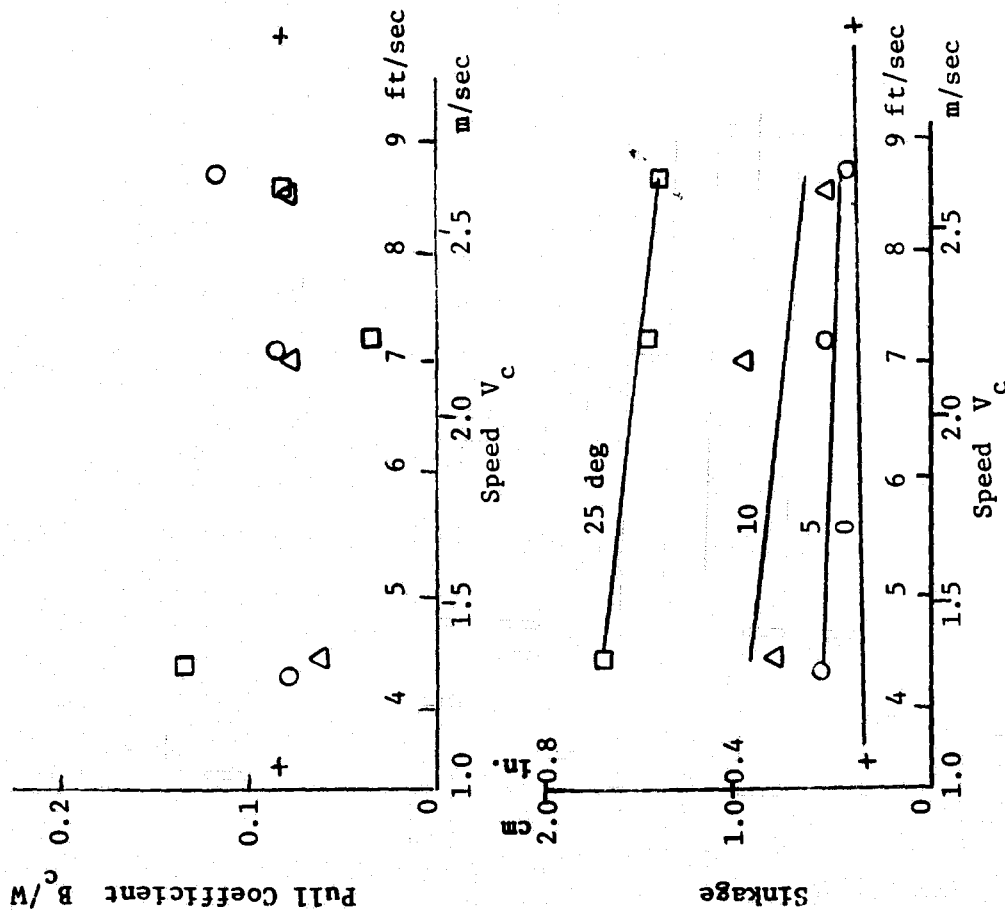
Effect of Yaw Angle on Performance

30. Inducing a yaw motion on a towed wheel affects the soil reaction forces, the skid or negative slip, and the amount of rutting or soil displacement that takes place.

Side-thrust coefficient

31. The relation of side-thrust coefficient to yaw angle for the overall test group is displayed in fig. 10. These data seem to indicate that the coefficient increased monotonically with respect

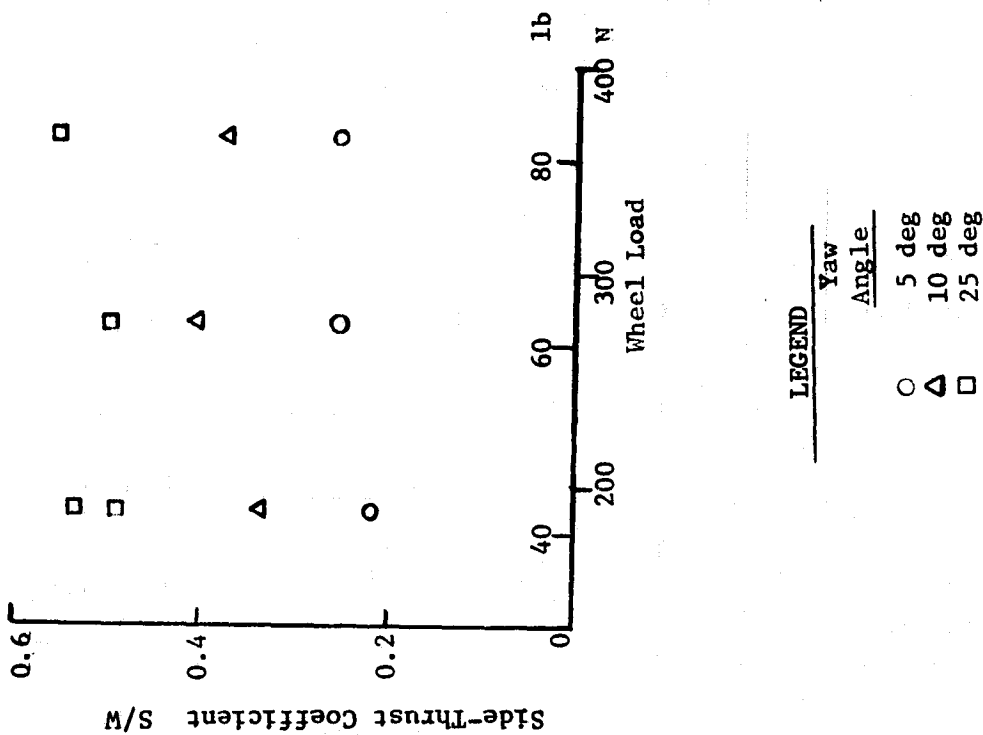
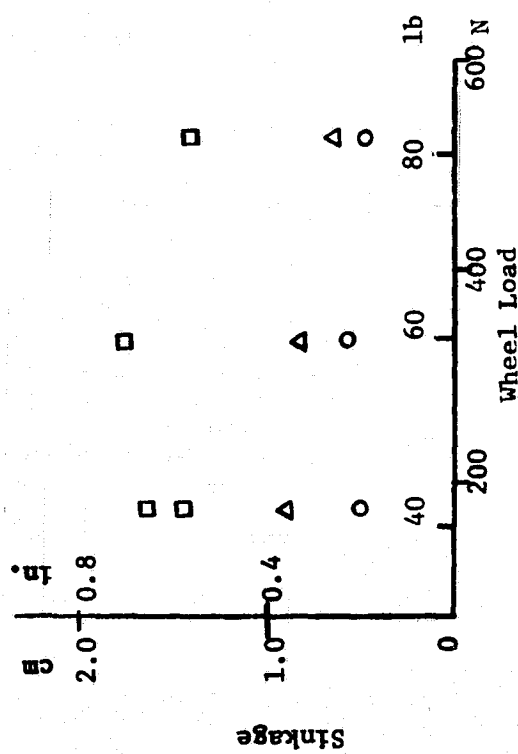
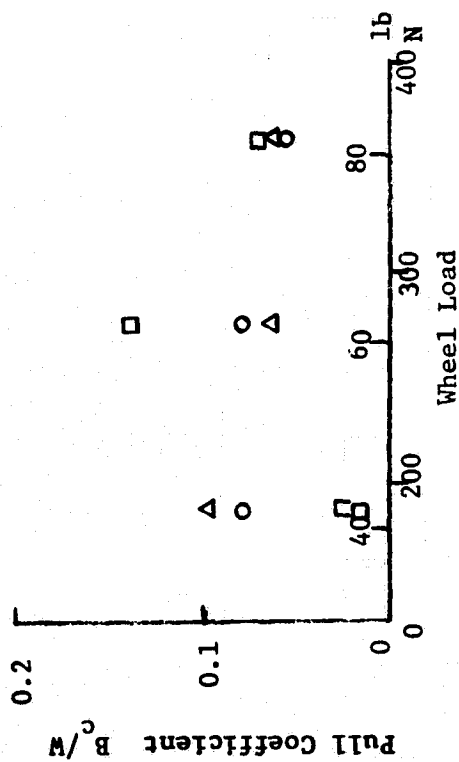
*Performance data from LRV test programs conducted at WES.



NOTE: 0-deg yaw angle tests were conducted at 57-lb (253-N) load; all others at 62 lb (276 N).

LEGEND	
Yaw Angle	
+	0 deg
o	5 deg
Δ	10 deg
□	25 deg

Fig. 8. Effect of speed on performance of 50% chevron-covered GM wheel; speed range 3.5-10.0 ft/sec (1.07-3.05 m/sec); $G \approx 3.7 \text{ lb/in.}^2 (\approx 1.0 \text{ MN/m}^2)$



LEGEND

Symbol	Yaw Angle
○	5 deg
△	10 deg
□	25 deg

Fig. 9. Effect of wheel load on performance of 50% chevron-covered GM wheel; load range 42-82 lb (187-365 N); nominal speed 4.5 ft/sec (1.37 m/sec)

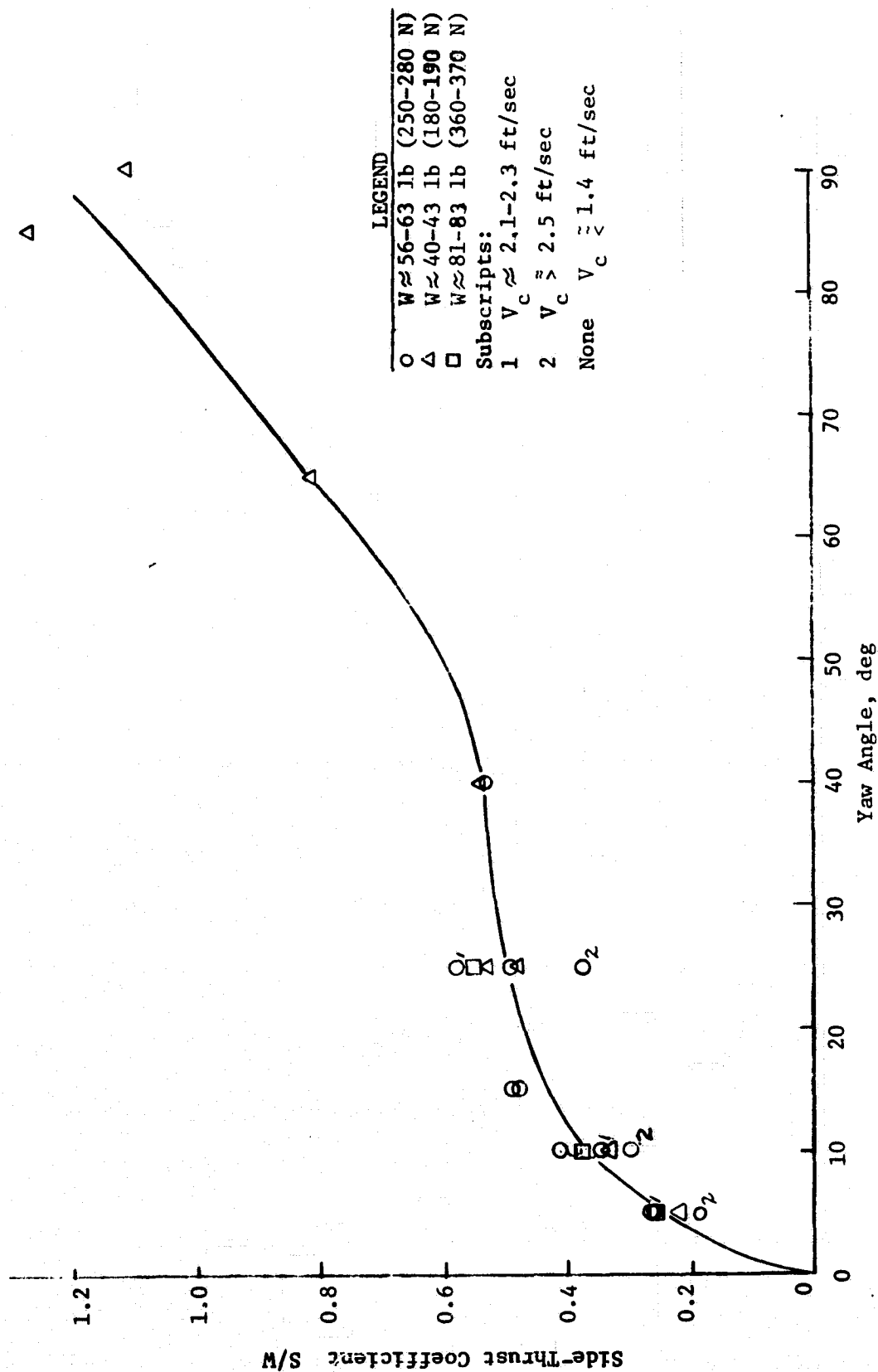


Fig. 10. Yaw angle versus side-thrust coefficient for the 50% chevron-covered GM wheel; load range 40-83 lb (180-370 N); speed range 3.5-10.0 ft/sec (1.07 to 3.05 m/sec)

to yaw angle in the range from 0 to 90 deg, and reached a value in excess of 1.0, i.e. side thrust became greater than wheel load. However, the scarcity of data in the range of 40 to 90 deg and the fact that the coefficient was 15 percent higher at 85 deg than at 90 deg suggest that the side-thrust coefficient may have reached a maximum at a yaw angle somewhere between 65 and 90 deg. An analysis of probable sources of error was made for the 85- to 90-deg tests, but nothing was noted that might have made either test appear more or less valid than the other. A rigorous analytical solution to define the relation of the side-thrust coefficient to yaw angle cannot readily be made for this complex system. It can be stated, however, that the information that is available, combined with the logic that can be applied, does not seem to preclude the possibility of the existence of a peak value of side thrust at some yaw angle less than 90 deg.

Pull coefficient

32. The relation of the pull coefficient to yaw angles for the overall test group is shown in fig. 11. The pull coefficient for the 0-deg yaw tests in this group and from 0-deg yaw tests with this wheel in a second dynamometer system (all tests were conducted on LSS₄) averaged approximately 0.10. There appears to be a slight tendency for pull coefficient to decrease with increasing yaw angle, although the data scatter is so great that no definitive trend can be established.

Skid (negative slip) versus yaw angle

33. Past experience has indicated that all towed wheels operating in deforming soils experience some skidding. Skid, as shown in fig. 12, is based on the rotational speed of the wheel about its own axis and

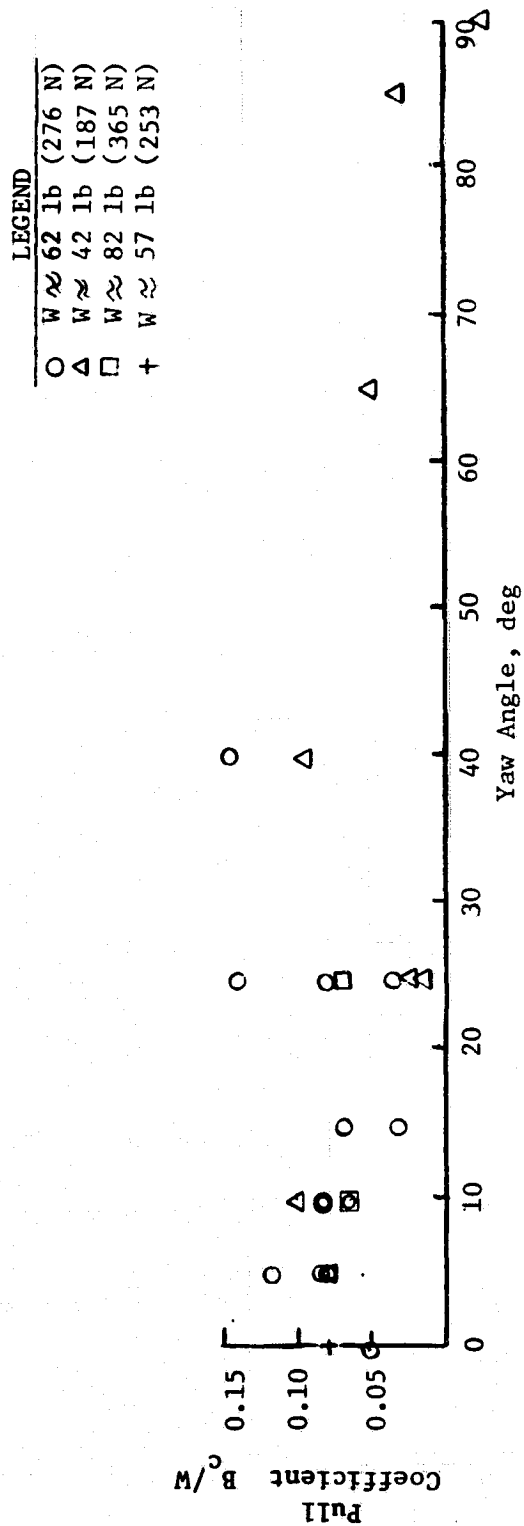


Fig. 11. Yaw angle versus pull coefficient for the 50% chevron-covered GM wheel;
load range 42-82 lb (187-365 N);
speed range 3.5-10.0 ft/sec (1.07-3.05 m/sec)

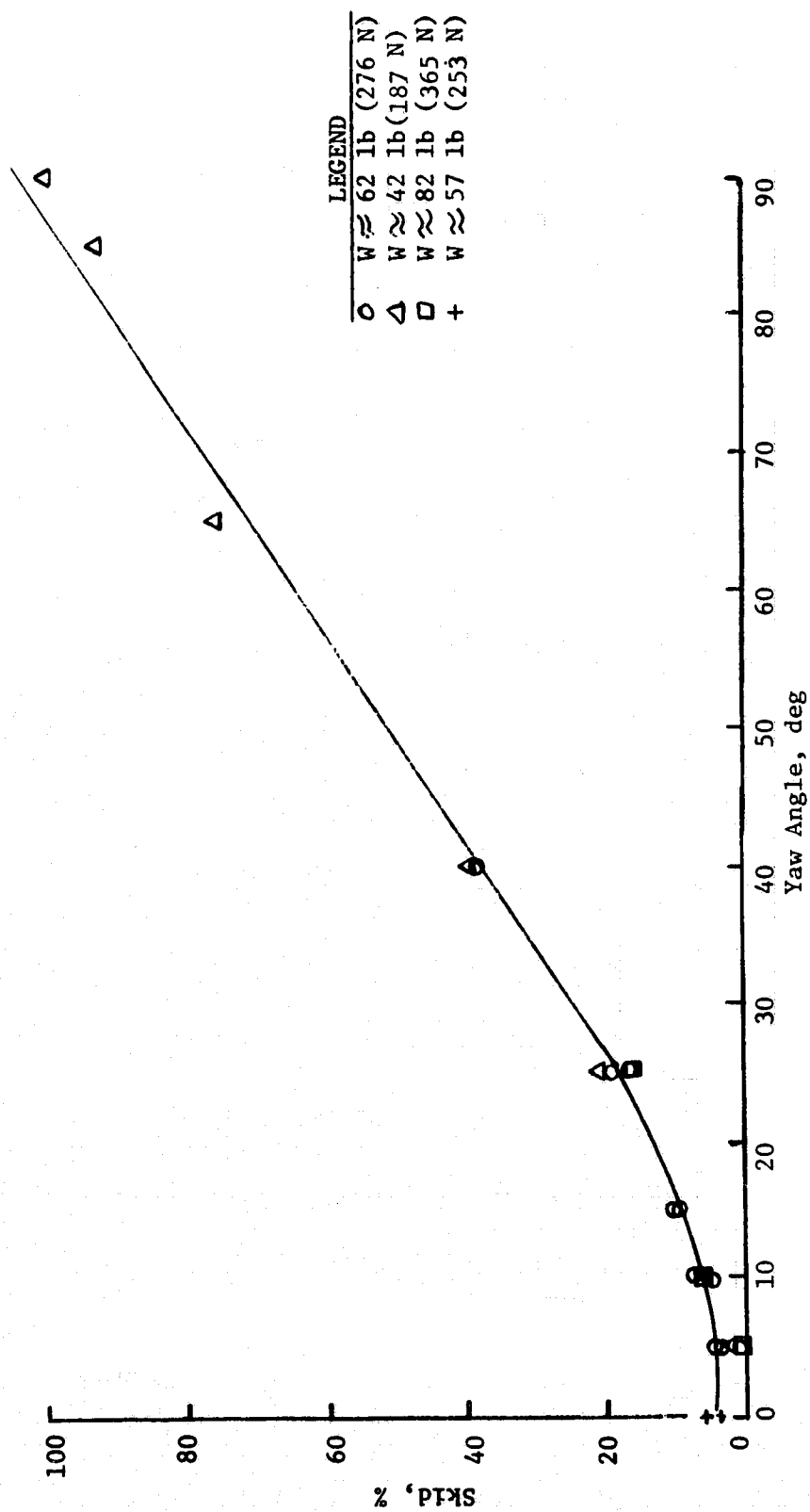


Fig. 12. Yaw angle versus skid for the 50% chevron-covered GM wheel;
 load range 42-82 lb (187-365 N);
 speed range 3.5-10.0 ft/sec (1.07-3.05 m/sec)

the speed of the carriage, i.e. no adjustment was made to account for the fact that the plane of rotation and plane of the direction of travel do not coincide. Fig. 12 shows that skid increased with yaw angle, and that the relation was not noticeably affected by speed or load.

Rut depth

34. Rut depth increased monotonically with yaw angle from 5 to 90 deg for the 42-1b (187-N) wheel load, as shown in fig. 13.

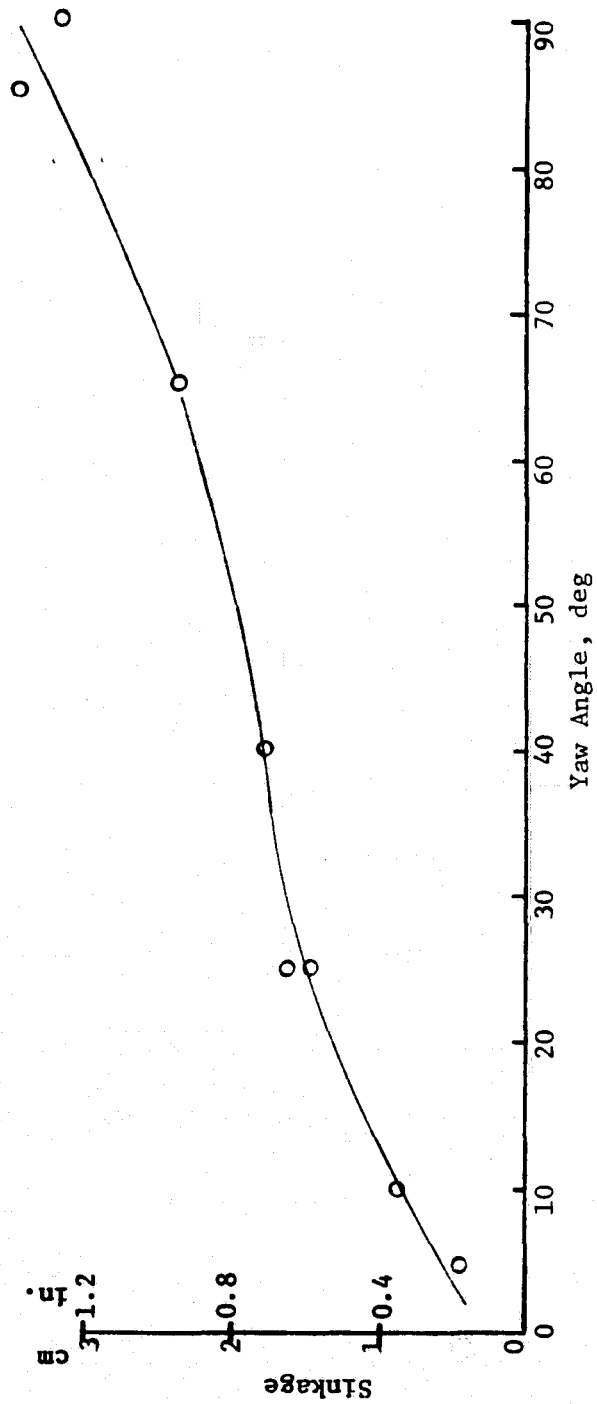


Fig. 13. Yaw angle versus sinkage for the 50% chevron-covered GM wheel;
42-lb (187-N) load; 4.5 ft/sec (1.37 m/sec) speed

PART V: CONCLUSIONS AND RECOMMENDATIONS

Conclusions

35. Based on the information presented herein, it is concluded that:
- a. Speed has an effect on side-thrust coefficient and rut depth for yaw angles other than 0 deg.
 - b. The effect of wheel load on the side-thrust coefficient, the pull coefficient, and rut depth is not significant.
 - c. The side-thrust coefficient increases as the yaw angle, and the actual side-thrust force is higher than the static wheel load at yaw angles of 85 and 90 deg.
 - d. The pull coefficient is probably highest for the 0-deg yaw angle and decreases slightly as the yaw angle is increased.
 - e. The percentage of skid appears to be relatively independent of load and speed, and increases as the yaw angle in a near linear fashion.

Recommendations

36. It is recommended that:
- a. The data obtained from this program be reviewed and used as a guide in the development of future test programs.
 - b. A future test program include additional towed-wheel tests conducted at yaw angles from 25 to 90 deg, and tests with driven and/or braked wheels conducted at various yaw angles.
 - c. An effort be made to increase the overall accuracy of the measuring systems.

Table 1
Wheel Data

Wheel	Load	Measured Rolling		Section Height		Static Deflection		Wheel Diameter	
		Circumference*		Unloaded		at Vertical Axle			
lb	N	m	in.	cm	in.	cm	in.	cm	in.
42	187	2.198	86.54	18.84	7.418	4.08	1.606	81.99	32.28
57	253	2.132	83.94	-	-	4.97	1.958	-	-
62	276	2.132	83.94	-	-	5.51	2.168	-	-
82	365	2.096	82.52	-	-	6.09	2.398	-	-

*Measured with towed wheel on unyielding surface.

Table 2

Wheel Performance Data Summary

Test No.	Yaw Angle deg	G		W, N		V _c , m/sec		V _w , m/sec		S, N		B, N		B _c	B/W _c	Rut Depth		Skid, %
		MN/m ³	Pcl	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev			in.	cm	
21	0	1.07	3.97	254	1.9	1.06	.001	1.05	.005	--	--	-20.5	1.7	-20.5	.081	0.14	0.36	1.0
22	0	0.97	3.57	254	6.0	3.05	0	2.94	.034	--	--	-20.4	5.4	-20.4	.080	0.15	0.38	3.8
25	5	1.01	3.73	277	2.3	1.31	.007	1.31	.008	71.4	2.7	-18.0	1.2	-21.6	.078	0.23	0.58	0
26	-5	1.08	3.98	277	2.8	1.32	.002	1.30	.006	-63.8	1.6	-32.3	1.5	-28.1	.101	0.22	0.56	1.5
27	10	0.89	3.48	276	17.0	1.35	--	1.29	--	113.0	6.0	-11.2	6.0	-16.9	.061	0.32	0.81	4.4
28	15	1.02	3.75	276	12.0	1.33	--	1.22	--	134.8	9.8	-1.4	7.5	-8.1	.029	0.18	0.46	8.3
29	25	1.00	3.68	277	10.0	1.34	--	1.12	--	157.5	6.5	-30.0	5.0	-37.9	.137	0.69	1.75	16.4
30	40	1.02	3.75	274	9.0	1.30	--	0.80	--	144.8	8.8	-32.0	9.7	-39.2	.143	0.77	1.96	38.5
31	5	0.97	3.56	189	4.8	1.32	.004	1.28	.008	41.5	2.5	-12.2	1.3	-14.3	.076	0.19	0.48	3.0
32	10	1.25	4.60	190	4.2	1.33	.006	1.26	.011	63.7	4.4	-15.2	2.3	-18.4	.097	0.35	0.89	5.3
33	25	1.06	3.90	186	0.5	1.31	.003	1.10	.014	99.2	5.8	0.7	1.0	-4.3	.023	0.57	1.45	16.0
34	25	1.01	3.73	367	0.6	1.32	.008	1.12	.006	202.9	7.6	-15.2	1.8	-25.3	.069	0.55	1.40	15.2
35	10	0.99	3.66	364	0.4	1.34	.004	1.27	.008	135.1	4.6	-16.9	2.3	-21.6	.059	0.25	0.63	5.2
36	5	1.14	4.22	365	4.4	1.31	.005	1.30	.013	94.0	3.9	-15.0	2.1	-19.7	.054	0.18	0.46	0.8
37	5	0.91	3.36	278	8.1	2.19	.034	2.10	.036	74.7	2.2	-19.3	2.7	-23.0	.083	0.22	0.56	4.1
38	10	1.01	3.73	274	4.5	2.15	.023	2.03	.024	93.0	5.4	-16.9	4.2	-21.5	.078	0.39	0.99	5.6
39	25	0.87	3.21	277	6.4	2.21	.024	1.85	.019	161.0	9.0	-1.2	6.0	-9.2	.033	0.60	1.52	16.3
40	25	1.17	4.30	280	7.6	2.64	.023	2.15	.030	105.2	5.2	-17.3	3.8	-22.3	.080	0.57	1.45	18.6
41	10	0.95	3.51	276	4.0	2.60	.019	2.46	.018	80.2	4.0	-17.5	4.3	-21.5	.078	0.21	0.53	5.4
42	5	1.04	3.85	277	10.0	2.66	.020	2.56	.021	50.4	4.2	-29.9	2.6	-32.4	.117	0.17	0.43	3.7
43	15	0.90	3.33	276	2.9	1.33	.008	1.23	.008	130.8	6.7	-11.5	2.7	-18.0	.065	0.29	0.74	7.5
44	25	1.02	3.77	187	4.0	1.37	.007	1.09	.009	90.9	4.7	-1.4	1.3	-3.1	.016	0.64	1.63	20.4
45	40	1.05	3.88	188	8.5	1.33	0	0.83	.030	101.1	9.4	-12.7	3.7	-17.8	.095	0.70	1.78	37.6
46	65	0.90	3.31	188	5.3	1.31	.006	0.31	.031	152.2	10.7	-10.9	2.6	-18.5	.098	0.93	2.36	76.3
47	85	1.20	4.42	186	4.6	1.33	.009	0.10	.316	235.5	10.3	6.8	7.9	5.0	.027	1.18	2.99	92.5
48	90	0.96	3.55	185	1.2	1.31	.010	-0.03*	.007*	204.9	4.3	18.5	3.1	8.0	(.043)	1.05	2.67	100.0*

*V_w assumed zero based on photographic evidence.

Table 3
Detailed Computer Listing of Performance Parameters

Test No. 21: 0-deg yaw angle									
V_w m/sec	V_c m/sec	W N	B N	S N	V_w m/sec	V_c m/sec	W N	B N	S N
1.053	1.023	246.4	-5.2	12.3	1.049	1.057	252.1	-19.7	3.5
1.053	1.034	247.4	-5.4	12.5	1.049	1.056	251.2	-19.1	3.3
1.061	1.040	253.0	-6.6	11.4	1.047	1.057	252.7	-18.9	3.6
1.053	1.046	249.2	-6.8	9.2	1.049	1.057	253.3	-18.9	3.7
1.055	1.043	244.6	-4.7	7.4	1.048	1.055	253.6	-19.4	3.5
1.057	1.051	246.6	-4.6	7.7	1.047	1.055	254.9	-19.5	3.9
1.062	1.052	253.7	-4.3	8.7	1.048	1.056	256.4	-19.5	3.8
1.064	1.052	251.8	-1.9	9.9	1.045	1.055	257.9	-20.7	4.1
1.053	1.051	249.8	-1.4	11.5	1.040	1.054	254.7	-20.7	4.1
1.071	1.051	253.4	-2.0	11.9	1.038	1.055	249.0	-19.2	4.7
1.073	1.051	258.0	-2.0	11.3	1.040	1.056	247.6	-19.1	5.4
1.073	1.053	255.3	-2.3	9.9	1.041	1.057	251.0	-20.0	5.6
1.071	1.053	253.0	-2.7	8.8	1.043	1.057	252.5	-19.7	6.5
1.070	1.054	253.7	-3.3	7.9	1.047	1.057	253.7	-20.2	7.0
1.070	1.053	256.0	-3.6	7.0	1.051	1.057	255.0	-20.2	7.2
1.068	1.053	257.4	-4.7	5.7	1.051	1.057	255.3	-19.5	6.6
1.065	1.051	253.4	-4.3	6.1	1.051	1.057	254.4	-19.2	6.2
1.064	1.051	251.7	-5.2	7.0	1.052	1.059	254.0	-19.2	5.1
1.064	1.053	252.5	-4.3	7.7	1.051	1.060	255.5	-18.7	4.9
1.065	1.055	252.9	-4.1	7.7	1.050	1.061	256.0	-20.2	4.4
1.063	1.055	250.6	-3.0	7.7	1.050	1.060	256.0	-20.3	3.9
1.061	1.054	250.2	-3.3	7.2	1.049	1.060	255.6	-21.1	3.8
1.061	1.054	254.1	-2.3	6.3	1.049	1.060	254.2	-21.5	3.9
1.062	1.054	257.6	-3.6	4.9	1.050	1.062	252.2	-21.0	4.2
1.060	1.054	258.7	-4.3	3.6	1.048	1.060	253.3	-20.7	3.9
1.056	1.054	254.5	-2.7	4.1	1.047	1.060	253.8	-20.2	3.9
1.053	1.055	251.8	-1.1	5.3	1.045	1.061	252.9	-19.9	3.4
1.054	1.055	255.7	-2.2	6.6	1.045	1.061	253.2	-19.4	3.5
1.054	1.053	257.0	-1.4	7.9	1.045	1.060	254.7	-20.0	2.8
1.053	1.051	248.6	-1.2	10.1	1.042	1.060	256.5	-21.0	2.3
1.059	1.051	246.5	-4.6	11.0	1.039	1.060	255.3	-21.5	1.8
1.056	1.053	253.8	-7.3	9.9	1.040	1.061	250.9	-20.8	2.5
1.050	1.053	255.6	-8.2	8.0	1.042	1.060	249.5	-20.3	3.3
1.049	1.054	252.7	-10.1	7.1	1.045	1.059	252.6	-20.3	3.6
1.053	1.053	254.9	-12.1	5.9	1.049	1.059	253.5	-20.0	4.7
1.053	1.053	260.1	-11.9	4.6	1.052	1.059	254.7	-20.7	5.7
1.053	1.052	258.3	-11.3	3.8	1.053	1.057	256.6	-21.3	6.5
1.052	1.052	249.9	-11.3	3.3	1.053	1.056	257.0	-21.8	5.8
1.049	1.052	248.0	-12.2	2.3	1.052	1.057	255.7	-22.1	5.5
1.047	1.054	253.2	-12.2	1.8	1.051	1.057	255.1	-22.7	4.6
1.043	1.054	255.3	-14.6	.7	1.051	1.056	253.5	-23.1	4.3
1.049	1.054	254.4	-17.6	.0	1.051	1.056	253.2	-23.1	3.3
1.049	1.055	256.4	-20.0	0.0	1.051	1.057	253.6	-23.5	3.0
1.053	1.058	257.9	-21.0	.2	1.051	1.057	254.0	-23.5	3.3
1.057	1.058	256.7	-19.7	-.3	1.049	1.055	252.7	-23.5	3.9
1.057	1.059	256.8	-19.1	.0	1.049	1.055	251.1	-22.6	4.4
1.055	1.060	254.5	-18.1	.4	1.047	1.057	252.9	-23.5	4.5
1.053	1.060	250.2	-16.4	1.3	1.046	1.058	255.2	-24.2	4.5
1.056	1.059	249.4	-15.4	2.3	1.046	1.058	254.0	-24.2	4.2
1.058	1.059	252.6	-17.5	3.0	1.047	1.060	252.5	-23.8	3.9
1.060	1.059	253.2	-17.2	4.3	1.048	1.062	254.4	-24.8	2.7
1.064	1.059	252.3	-17.2	5.8	1.047	1.064	255.9	-25.3	2.3
1.065	1.058	254.5	-17.5	6.4	1.045	1.063	252.8	-24.5	2.6
1.062	1.057	255.8	-18.0	6.3	1.046	1.063	247.9	-23.5	2.3
1.059	1.057	256.0	-18.3	6.3	1.049	1.063	247.9	-23.5	2.6
1.056	1.057	256.0	-19.2	6.0	1.051	1.063	252.1	-25.1	3.0
1.053	1.057	255.8	-19.2	5.4	1.054	1.061	255.6	-26.2	3.7
1.053	1.057	255.1	-19.7	4.4	1.061	1.060	260.5	-29.9	3.8
1.050	1.059	256.1	-20.2	4.1	1.068	1.060	263.9	-32.4	4.4
1.049	1.059	255.2	-20.0	4.0	1.070	1.060	261.4	-31.3	4.0

(Continued)

(1 of 23 Sheets)

Table 3 (Continued)

Test No. 22; 0-deg yaw angle										
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N	
2.902	1.963	310.4	-6.5	-4.2	2.935	1.963	247.1	-12.2	-.1	
3.108	1.963	312.7	-3.0	-3.6	2.931	1.963	250.7	-13.3	.1	
3.109	1.963	292.8	1.1	-4.4	2.979	1.963	256.8	-13.3	.1	
3.033	1.963	262.1	3.3	-6.0	2.979	1.963	259.9	-14.4	-.2	
3.045	1.963	224.2	7.3	-6.0	2.979	1.963	259.0	-13.6	-.5	
2.992	1.963	195.1	3.0	-6.6	2.979	1.963	261.9	-16.3	-1.1	
2.944	1.963	177.6	6.1	-5.7	2.979	1.963	262.7	-17.0	-1.4	
2.904	1.963	171.5	3.6	-5.3	2.975	1.963	259.8	-19.2	-1.9	
2.331	1.963	136.5	.3	-4.7	2.969	1.963	258.0	-19.4	-1.1	
2.337	1.963	221.1	-3.2	-5.9	2.964	1.963	256.3	-20.4	-.3	
2.911	1.963	263.4	-5.7	-5.4	2.959	1.963	252.1	-19.7	-.8	
2.950	1.963	300.9	-5.4	-4.9	2.953	1.963	247.9	-20.0	-1.6	
2.993	1.963	332.1	-6.2	-3.7	2.945	1.963	247.1	-13.8	-1.7	
3.047	1.963	339.3	-3.3	-2.2	2.933	1.963	243.4	-17.9	-2.1	
3.075	1.963	321.1	-.9	-.4	2.930	1.963	242.1	-17.3	-3.2	
3.079	1.963	290.9	2.0	.2	2.924	1.963	245.5	-13.3	-3.4	
3.033	1.963	257.6	2.0	.0	2.919	1.963	248.8	-17.3	-2.6	
3.023	1.963	224.7	4.1	-.5	2.915	1.963	248.6	-17.3	-1.1	
2.335	1.963	205.6	2.5	-1.1	2.925	1.963	251.5	-17.9	-.7	
2.951	1.963	201.5	2.2	-1.0	2.933	1.963	254.8	-17.9	.3	
2.332	1.963	204.7	.8	-1.0	2.938	1.963	252.4	-16.3	1.0	
2.929	1.963	220.4	-.3	-2.0	2.940	1.963	253.6	-18.3	1.1	
2.944	1.963	247.2	-3.2	-3.2	2.943	1.963	257.0	-18.3	.1	
2.970	1.963	273.3	-3.3	-3.7	2.940	1.963	260.1	-18.9	-1.1	
2.999	1.963	292.2	-1.9	-4.1	2.938	1.963	260.3	-19.7	-2.1	
3.013	1.963	303.5	.3	-4.1	2.937	1.963	265.1	-21.3	-2.5	
3.023	1.963	296.1	1.4	-3.1	2.936	1.963	263.5	-20.4	-2.5	
3.011	1.963	275.6	2.2	-3.0	2.931	1.963	259.6	-23.3	-2.8	
2.931	1.963	253.3	2.2	-3.3	2.928	1.963	256.3	-22.6	-1.7	
2.941	1.963	233.0	-.4	-4.3	2.920	1.963	252.9	-23.4	-.7	
2.907	1.963	218.9	-4.3	-6.0	2.911	1.963	248.6	-22.1	.0	
2.335	1.963	222.4	-6.7	-7.8	2.904	1.963	245.0	-23.4	-.0	
2.373	1.963	236.8	-7.7	-7.8	2.900	1.963	247.4	-21.8	.2	
2.377	1.963	244.3	-8.6	-7.9	2.895	1.963	245.7	-23.1	-.9	
2.394	1.963	253.0	-9.1	-7.9	2.891	1.963	246.6	-22.1	-1.8	
2.920	1.963	261.7	-8.6	-7.8	2.887	1.963	246.7	-25.2	-3.1	
2.941	1.963	263.3	-8.5	-7.7	2.884	1.963	250.3	-24.5	-3.4	
2.955	1.963	257.5	-8.5	-7.4	2.883	1.963	250.1	-24.9	-2.8	
2.954	1.963	257.7	-9.3	-7.4	2.879	1.963	253.4	-25.2	-1.9	
2.957	1.963	260.2	-9.1	-5.5	2.881	1.963	254.1	-26.0	-1.0	
2.553	1.963	253.8	-8.8	-4.2	2.885	1.963	252.3	-24.9	.5	
2.953	1.963	259.7	-7.5	-2.6	2.890	1.963	251.9	-25.8	1.4	
2.956	1.963	262.5	-7.5	-2.8	2.895	1.963	251.7	-27.1	1.1	
2.953	1.963	262.0	-7.0	-3.3	2.899	1.963	252.4	-27.7	.8	
2.951	1.963	257.7	-7.0	-4.0	2.901	1.963	255.0	-29.4	.8	
2.949	1.963	256.7	-7.5	-4.3	2.902	1.963	261.1	-30.0	.2	
2.943	1.963	254.6	-10.4	-3.8	2.904	1.963	263.4	-31.1	-.2	
2.946	1.963	249.9	-10.9	-2.4	2.904	1.963	264.5	-32.1	-1.6	
2.946	1.963	248.8	-12.3	-.5	2.903	1.963	264.2	-33.4	-1.7	
2.943	1.963	249.6	-13.9	-.8	2.902	1.963	262.4	-34.3	-2.0	
2.949	1.963	249.7	-17.1	-1.7	2.902	1.963	259.4	-35.8	-.5	
2.953	1.963	249.6	-17.8	-2.3	2.903	1.963	259.9	-36.9	-.4	
2.961	1.963	255.4	-18.4	-2.4	2.909	1.963	263.1	-35.9	1.8	
2.970	1.963	258.9	-17.5	-2.4	2.916	1.963	262.6	-33.1	2.9	
2.975	1.963	260.4	-16.7	-2.1	2.924	1.963	262.3	-31.4	3.2	
2.981	1.963	259.1	-14.7	-.8	2.932	1.963	260.7	-27.3	1.3	
2.938	1.963	256.0	-12.6	-.3	2.936	1.963	251.8	-22.0	.6	
2.993	1.963	248.8	-12.0	-.2	2.933	1.963	230.2	-14.7	.1	
2.991	1.963	245.3	-12.0	-.4	2.919	1.963	203.2	-6.7	-.4	
2.937	1.963	246.3	-13.6	-.2	2.893	1.963	173.4	-.6	-.5	

(Continued)

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Table 3. (Continued)

Test No. 25 : 5-deg yaw angle										
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N	
1.272	1.254	271.5	21.3	110.8	1.303	1.313	272.0	-16.7	70.4	
1.287	1.266	278.3	20.9	113.1	1.306	1.313	273.9	-16.7	71.2	
1.301	1.280	276.9	20.1	113.1	1.309	1.313	275.6	-16.1	73.1	
1.314	1.289	277.4	20.2	114.0	1.311	1.311	278.6	-17.1	74.3	
1.320	1.295	276.4	20.5	114.0	1.314	1.311	281.6	-16.1	75.6	
1.323	1.297	271.5	20.5	112.8	1.314	1.310	280.1	-16.1	76.8	
1.320	1.296	269.7	22.0	113.8	1.314	1.311	277.1	-15.5	77.5	
1.313	1.296	270.8	22.8	114.3	1.313	1.313	274.9	-15.5	77.2	
1.315	1.296	272.0	22.1	116.5	1.310	1.313	274.1	-15.3	77.0	
1.314	1.295	275.5	22.0	115.3	1.309	1.312	275.1	-16.1	76.3	
1.312	1.296	277.9	21.2	115.2	1.307	1.311	277.1	-16.7	74.3	
1.311	1.297	279.0	20.9	113.3	1.303	1.312	277.9	-17.4	73.1	
1.313	1.300	277.9	19.3	113.0	1.306	1.312	276.5	-17.2	71.9	
1.313	1.301	277.7	20.4	111.6	1.311	1.312	275.3	-16.6	71.2	
1.313	1.302	280.4	20.4	112.8	1.313	1.314	275.6	-18.0	69.9	
1.315	1.302	279.5	20.9	115.2	1.314	1.317	277.9	-17.4	70.4	
1.315	1.300	273.6	21.7	114.7	1.311	1.313	278.2	-18.0	69.9	
1.317	1.293	269.2	21.7	109.9	1.311	1.319	278.0	-18.8	69.4	
1.321	1.297	273.5	21.7	103.4	1.311	1.320	273.7	-19.6	63.4	
1.327	1.299	278.6	21.7	109.1	1.309	1.322	279.7	-19.6	63.0	
1.333	1.302	231.2	21.8	108.2	1.307	1.322	276.1	-19.9	67.9	
1.342	1.305	273.9	20.4	106.4	1.310	1.320	271.8	-13.5	69.6	
1.341	1.305	273.3	20.9	108.1	1.317	1.320	272.2	-18.3	71.2	
1.337	1.305	277.4	19.6	107.9	1.318	1.320	276.1	-18.2	72.1	
1.331	1.304	277.1	20.1	109.1	1.320	1.319	273.3	-17.7	73.8	
1.327	1.301	274.7	20.5	110.1	1.322	1.316	280.9	-18.6	75.1	
1.326	1.300	277.0	21.2	112.5	1.324	1.315	280.1	-18.6	75.1	
1.326	1.301	279.6	21.7	114.5	1.320	1.313	277.4	-17.4	73.6	
1.324	1.303	277.7	22.8	116.7	1.314	1.307	275.4	-13.0	72.9	
1.324	1.304	272.3	21.8	116.7	1.305	1.301	274.1	-17.7	71.6	
1.322	1.304	270.4	21.7	119.6	1.299	1.296	273.5	-17.7	70.2	
1.322	1.305	273.5	21.0	123.1	1.293	1.292	277.0	-18.3	68.9	
1.321	1.304	276.6	20.1	125.5	1.289	1.291	279.4	-19.1	63.9	
1.322	1.302	279.6	18.0	123.9	1.233	1.292	277.5	-18.5	69.0	
1.326	1.302	280.9	13.5	133.9	1.293	1.296	275.8	-19.0	69.0	
1.327	1.303	233.7	18.2	136.1	1.297	1.301	276.1	-18.2	70.4	
1.324	1.303	280.6	18.3	137.1	1.301	1.306	277.2	-18.8	70.4	
1.321	1.303	272.0	17.9	137.1	1.305	1.309	278.3	-18.8	70.2	
1.323	1.304	264.0	18.0	135.9	1.305	1.312	278.3	-19.4	69.2	
1.326	1.305	270.2	15.9	132.4	1.305	1.313	276.9	-19.1	63.9	
1.330	1.305	230.5	15.2	133.7	1.306	1.312	277.7	-20.1	67.2	
1.337	1.306	233.0	15.6	133.5	1.305	1.310	278.2	-20.2	66.8	
1.340	1.306	231.1	16.3	141.5	1.302	1.310	274.3	-20.2	67.2	
1.337	1.303	273.9	15.5	141.2	1.305	1.311	272.5	-18.6	68.9	
1.333	1.310	275.0	16.4	140.5	1.309	1.311	274.0	-19.0	69.7	
1.330	1.311	273.9	14.7	137.8	1.311	1.311	276.4	-13.2	70.1	
1.328	1.313	277.5	13.6	134.9	1.314	1.312	277.4	-18.6	71.1	
1.329	1.314	279.4	12.5	133.6	1.318	1.313	279.7	-19.0	70.7	
1.329	1.315	230.5	12.3	133.4	1.322	1.313	280.6	-19.3	71.4	
1.321	1.313	275.6	3.3	130.7	1.321	1.313	279.0	-18.3	72.3	
1.312	1.312	269.9	4.7	122.8	1.321	1.315	275.9	-19.0	73.6	
1.305	1.312	270.7	-1.2	111.1	1.318	1.317	273.9	-17.1	75.1	
1.304	1.312	277.2	-6.4	98.9	1.314	1.317	273.8	-16.7	77.2	
1.302	1.311	280.2	-12.3	86.8	1.311	1.315	275.6	-16.4	76.5	
1.301	1.311	280.5	-15.5	76.8	1.311	1.315	277.2	-17.1	75.0	
1.301	1.312	280.1	-16.4	73.3	1.313	1.316	277.0	-15.2	75.3	
1.295	1.311	273.9	-17.1	71.6	1.310	1.314	274.6	-14.4	75.3	
1.295	1.310	273.3	-18.6	70.1	1.310	1.314	269.9	-11.2	77.7	
1.293	1.311	276.7	-17.4	70.2	1.309	1.315	267.0	-9.6	82.7	
1.295	1.313	273.2	-16.7	71.2	1.308	1.317	269.9	-7.1	90.2	

(Continued)

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Table 3 (Continued)

Test No. 30; 40-deg yaw angle									
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N
.367	1.214	275.0	2.3	56.2	.300	1.283	274.2	-41.3	121.1
.371	1.233	274.5	7.3	36.4	.796	1.233	274.6	-49.8	120.7
.363	1.248	274.6	16.6	30.4	.792	1.236	274.7	-52.1	127.8
.881	1.282	274.8	13.3	23.3	.803	1.234	274.7	-43.5	136.1
.374	1.269	274.4	.7	17.9	.815	1.291	274.7	-35.4	140.8
.866	1.275	274.3	-4.0	21.6	.828	1.297	274.2	-33.1	143.5
.351	1.273	274.5	9.4	34.6	.835	1.294	274.3	-37.2	142.7
.355	1.275	274.2	4.3	31.4	.836	1.296	274.1	-36.6	142.4
.356	1.279	274.6	-3.4	40.0	.836	1.296	274.1	-39.2	143.4
.353	1.279	274.4	.9	51.6	.832	1.297	273.8	-33.8	147.4
.339	1.277	274.3	3.9	59.1	.825	1.293	274.4	-22.9	148.1
.920	1.277	274.3	-4.3	69.0	.836	1.299	274.8	-21.0	153.0
.926	1.231	274.3	-2.8	72.3	.840	1.298	274.9	-22.9	156.7
.934	1.278	274.7	3.1	67.4	.847	1.301	275.0	-25.2	156.6
.941	1.279	274.8	2.7	71.9	.854	1.297	274.3	-26.1	159.3
.936	1.281	274.6	.4	80.9	.852	1.296	274.5	-27.0	158.8
.933	1.285	275.6	4.9	82.6	.831	1.293	273.4	-32.1	155.4
.940	1.284	275.6	2.5	79.2	.826	1.293	273.3	-35.4	154.5
.933	1.285	275.5	6.4	30.2	.814	1.298	273.8	-33.0	155.2
.941	1.288	275.9	1.6	83.7	.802	1.293	273.6	-31.5	153.9
.937	1.288	275.6	-1.9	33.9	.307	1.300	274.2	-26.7	153.7
.926	1.285	274.6	7.6	71.2	.810	1.299	274.2	-20.4	150.5
.923	1.281	275.2	3.1	70.1	.811	1.298	274.5	-24.4	146.3
.925	1.279	274.2	6.9	72.4	.810	1.295	273.8	-37.1	140.7
.935	1.273	274.8	12.3	75.1	.800	1.297	274.5	-46.8	139.0
.935	1.233	275.0	-2.1	75.6	.785	1.299	273.8	-50.3	138.6
.925	1.233	275.3	-6.7	72.3	.779	1.294	273.8	-45.0	142.9
.915	1.233	275.4	4.0	67.7	.788	1.296	274.6	-32.7	145.4
.913	1.234	275.4	-15.6	77.0	.788	1.296	274.8	-19.2	146.4
.905	1.231	274.9	-14.7	39.5	.804	1.297	274.8	-13.6	147.6
.900	1.232	274.9	6.6	92.2	.816	1.296	274.7	-21.7	146.9
.903	1.281	274.4	-2.7	113.5	.821	1.302	274.7	-29.6	146.8
.913	1.235	274.6	-4.9	160.8	.796	1.302	273.9	-35.6	144.9
.924	1.236	274.6	6.4	193.0	.776	1.298	273.8	-40.8	144.6
.920	1.238	274.5	3.6	196.6	.761	1.292	274.6	-36.0	141.5
.927	1.233	274.7	-1	208.3	.743	1.291	274.6	-27.6	141.0
.934	1.289	274.9	5.7	210.4	.736	1.290	274.8	-21.1	140.2
.933	1.291	275.0	3.0	193.9	.739	1.288	274.5	-17.4	139.2
.925	1.290	275.0	6.0	188.5	.761	1.290	274.2	-13.0	138.0
.931	1.289	275.0	5.2	192.0	.770	1.293	273.9	-27.0	136.6
.929	1.290	275.0	5.2	191.5	.783	1.294	273.9	-37.5	138.3
.923	1.293	275.2	2.4	195.6	.790	1.296	274.1	-44.7	137.0
.909	1.291	274.8	2.2	200.0	.790	1.294	274.1	-45.5	137.8
.909	1.292	274.8	-2.1	194.7	.783	1.296	274.3	-46.4	142.4
.900	1.295	274.5	-2.2	194.4	.780	1.299	273.4	-34.4	147.3
.395	1.297	274.7	-5.1	195.8	.776	1.299	273.4	-21.7	148.8
.394	1.293	274.6	-8.5	194.6	.782	1.299	273.7	-18.4	152.8
.333	1.294	274.1	-9.6	192.4	.793	1.305	273.4	-23.5	154.7
.379	1.295	273.3	-9.4	188.7	.805	1.312	274.3	-27.5	154.7
.375	1.296	273.3	-16.5	183.6	.807	1.307	274.3	-31.5	154.4
.367	1.294	273.6	-27.6	179.4	.806	1.307	274.5	-33.6	153.2
.355	1.293	273.5	-22.2	175.0	.796	1.310	274.1	-31.8	151.0
.345	1.291	273.8	-22.0	167.9	.790	1.310	274.6	-26.7	151.2
.341	1.287	274.3	-29.7	160.6	.770	1.301	273.7	-22.5	146.8
.341	1.284	273.9	-34.8	157.4	.755	1.300	273.9	-19.8	141.7
.842	1.283	274.1	-24.9	154.9	.748	1.301	274.3	-23.2	135.9
.841	1.286	274.1	-27.2	151.2	.750	1.298	273.8	-25.0	132.7
.841	1.284	273.7	-28.1	141.5	.747	1.302	274.8	-24.3	131.0
.327	1.286	274.1	-27.3	135.4	.757	1.303	274.5	-27.0	131.4
.314	1.283	274.4	-30.2	126.1	.755	1.309	274.9	-37.2	128.3

(Continued)

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Table 3 (Continued)

Test No. 31; 5-deg yaw angle									
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N
1.202	1.234	181.2	1.2	47.2	1.275	1.323	181.9	-10.3	43.5
1.247	1.259	189.1	4.3	47.4	1.281	1.321	187.5	-10.1	43.9
1.284	1.277	187.6	1.6	46.0	1.273	1.316	191.9	-10.4	43.9
1.270	1.290	185.3	3.6	45.6	1.289	1.316	196.6	-11.5	43.9
1.270	1.295	182.4	3.3	44.6	1.293	1.320	197.7	-12.1	45.1
1.255	1.306	177.9	3.1	44.2	1.300	1.320	194.9	-10.9	45.3
1.255	1.307	171.5	2.5	44.2	1.297	1.319	190.9	-11.3	44.4
1.256	1.310	176.7	5.6	48.2	1.302	1.324	184.3	-11.6	44.4
1.253	1.310	187.8	5.4	53.7	1.239	1.325	180.8	-11.8	44.4
1.271	1.313	197.8	6.5	56.8	1.286	1.325	184.3	-11.8	43.2
1.275	1.312	200.5	6.0	56.1	1.284	1.324	187.2	-12.7	43.0
1.272	1.305	199.8	6.3	57.0	1.231	1.325	189.2	-11.9	43.9
1.253	1.301	192.5	5.0	52.1	1.234	1.327	190.0	-10.9	44.9
1.255	1.304	179.9	3.9	45.4	1.287	1.324	188.7	-10.3	43.9
1.261	1.302	170.0	5.4	44.6	1.231	1.319	188.2	-10.0	44.0
1.263	1.299	176.0	6.5	49.1	1.275	1.317	187.3	-10.6	43.2
1.279	1.301	133.6	5.9	52.6	1.275	1.313	186.8	-11.5	42.3
1.294	1.303	193.5	6.9	59.6	1.271	1.312	190.5	-11.9	40.0
1.290	1.297	202.9	7.7	59.6	1.276	1.317	195.0	-13.1	40.0
1.284	1.302	196.2	5.0	55.2	1.283	1.318	194.1	-14.8	40.0
1.274	1.310	186.2	5.0	51.2	1.277	1.316	190.8	-13.3	40.9
1.263	1.313	177.3	6.6	48.1	1.281	1.319	185.7	-11.3	41.9
1.259	1.307	177.5	8.1	49.3	1.287	1.319	182.6	-11.0	42.5
1.271	1.310	184.5	9.5	60.0	1.286	1.323	183.5	-11.2	42.5
1.289	1.306	198.1	12.7	69.1	1.286	1.323	187.6	-10.9	43.5
1.300	1.300	205.0	12.2	75.2	1.293	1.330	193.7	-11.5	43.9
1.305	1.299	202.4	11.6	75.9	1.289	1.329	199.7	-12.5	43.7
1.304	1.307	189.3	8.1	68.9	1.282	1.330	196.3	-12.3	43.3
1.300	1.303	178.6	7.8	60.5	1.290	1.325	189.9	-12.5	41.9
1.263	1.306	175.5	3.0	52.3	1.286	1.322	184.4	-12.1	40.2
1.255	1.307	176.7	-4	45.1	1.234	1.322	181.4	-13.7	37.6
1.253	1.310	186.2	-3.9	44.9	1.291	1.323	181.7	-12.7	37.6
1.250	1.312	197.8	-4.5	48.4	1.289	1.320	185.1	-13.0	38.6
1.268	1.317	204.7	-6.8	54.5	1.274	1.316	190.3	-12.5	39.5
1.273	1.313	200.3	-5.9	61.7	1.279	1.316	196.4	-12.2	40.4
1.282	1.319	189.3	-2.3	63.2	1.276	1.313	193.4	-11.3	43.0
1.281	1.316	174.5	-1.8	67.7	1.275	1.319	192.0	-13.0	42.3
1.271	1.309	172.2	-1.9	67.3	1.277	1.316	192.9	-11.9	40.7
1.271	1.309	177.9	-1.9	68.0	1.277	1.321	193.4	-12.4	40.4
1.274	1.305	185.3	-3.9	67.7	1.271	1.323	189.3	-13.0	39.5
1.292	1.307	196.6	-4.0	69.1	1.274	1.322	186.5	-12.2	38.4
1.294	1.304	202.6	-4.6	69.6	1.267	1.320	190.4	-12.7	37.9
1.297	1.309	193.2	-3.9	67.1	1.262	1.324	191.7	-13.7	37.9
1.291	1.308	189.8	-4.5	61.5	1.262	1.326	189.9	-15.0	36.1
1.239	1.316	185.9	-2.7	57.0	1.271	1.326	186.1	-13.3	39.0
1.231	1.315	184.4	-4.6	52.8	1.284	1.329	184.0	-13.9	37.7
1.279	1.319	186.8	-6.0	50.0	1.287	1.327	186.9	-13.6	38.1
1.283	1.313	189.1	-7.7	49.5	1.290	1.327	187.6	-14.6	33.1
1.294	1.318	190.2	-9.0	48.2	1.291	1.324	189.3	-13.7	33.1
1.304	1.315	191.3	-10.0	48.1	1.286	1.324	192.5	-15.1	36.5
1.304	1.315	188.5	-9.8	47.9	1.231	1.322	195.0	-14.5	36.0
1.305	1.316	187.4	-9.8	48.9	1.279	1.326	192.5	-14.0	34.4
1.300	1.315	185.7	-10.4	48.4	1.256	1.326	187.4	-13.0	33.9
1.278	1.310	188.6	-9.8	47.2	1.253	1.321	188.2	-12.2	33.0
1.274	1.312	190.0	-10.7	47.4	1.241	1.321	187.9	-13.1	33.2
1.271	1.314	190.8	-10.7	45.8	1.241	1.317	188.6	-13.4	35.1
1.268	1.317	189.2	-11.5	44.4	1.253	1.319	189.9	-12.4	37.7
1.269	1.320	191.0	-11.2	43.5	1.267	1.322	192.2	-11.0	43.2
1.282	1.324	185.3	-10.1	45.4	1.284	1.325	185.7	-8.1	49.6
1.280	1.321	179.5	-9.5	43.5	1.292	1.322	180.8	-4.6	55.1

(Continued)

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Table 3 (Continued)

Test No. 32; 10-deg yaw angle										
V_w m/sec	V_c m/sec	W N	B N	S N	V_w m/sec	V_c m/sec	W N	B N	S N	
1.670	1.384	262.6	151.6	91.3	1.248	1.328	185.6	-12.1	61.0	Approach
1.197	1.242	188.2	-0.6	46.2	1.265	1.337	187.6	-9.5	65.2	
1.211	1.262	182.5	-2.1	44.1	1.244	1.325	187.8	-14.2	62.0	Approach
1.233	1.283	182.2	-3.9	44.1	1.257	1.324	194.8	-11.8	65.0	
1.235	1.297	179.5	-2.4	45.7	1.239	1.317	195.8	-15.9	65.5	Approach
1.246	1.304	179.1	-0.3	48.3	1.261	1.324	195.1	-11.8	70.0	
1.244	1.308	182.4	-0.9	49.9	1.256	1.324	188.8	-14.2	68.5	Approach
1.243	1.301	186.6	-1.2	48.1	1.266	1.325	187.1	-12.3	67.8	
1.240	1.301	191.5	.4	49.7	1.263	1.330	184.1	-14.1	68.8	Approach
1.234	1.299	192.5	.9	53.0	1.266	1.333	187.0	-14.1	68.8	
1.244	1.303	190.2	.9	50.4	1.260	1.331	191.8	-16.1	70.7	Approach
1.244	1.307	188.5	.3	48.1	1.251	1.324	197.9	-16.8	70.6	
1.245	1.316	187.1	.7	52.0	1.255	1.333	201.0	-15.1	74.7	Approach
1.236	1.317	188.3	.9	53.0	1.257	1.325	196.6	-16.5	69.7	
1.256	1.320	193.0	.1	48.8	1.263	1.326	193.0	-13.8	67.6	Approach
1.253	1.322	194.8	.7	48.6	1.250	1.320	188.5	-15.6	62.4	
1.256	1.319	193.5	.4	50.6	1.258	1.327	188.4	-13.2	63.1	Approach
1.256	1.312	190.9	1.2	52.3	1.229	1.314	185.4	-18.0	57.2	
1.253	1.313	192.4	-0.9	50.4	1.236	1.321	191.3	-16.5	59.8	Approach
1.257	1.320	190.9	.9	50.2	1.230	1.320	191.3	-18.6	60.1	
1.258	1.317	182.7	-0.9	47.6	1.240	1.325	193.8	-17.1	62.7	Approach
1.261	1.322	182.6	1.0	47.6	1.249	1.326	189.3	-18.2	64.6	
1.273	1.324	189.4	.9	51.1	1.261	1.327	188.2	-15.1	68.3	Approach
1.285	1.319	192.2	2.7	54.2	1.262	1.326	185.7	-14.2	69.0	
1.290	1.319	195.3	4.1	61.9	1.254	1.320	186.6	-15.8	66.9	Approach
1.279	1.319	197.8	5.0	68.8	1.256	1.324	188.3	-14.2	67.4	
1.282	1.318	195.1	5.4	73.0	1.234	1.316	191.2	-14.2	62.6	Approach
1.268	1.322	187.7	3.9	70.6	1.248	1.329	196.1	-13.3	64.8	
1.253	1.318	184.4	2.7	64.8	1.241	1.326	194.5	-16.1	63.6	Approach
1.256	1.321	183.9	4.5	64.8	1.261	1.339	193.1	-11.0	68.3	
1.252	1.316	184.0	2.2	66.4	1.258	1.332	184.5	-14.4	65.7	Approach
1.261	1.316	191.3	3.0	72.0	1.282	1.345	185.5	-12.9	67.3	
1.260	1.307	195.4	3.4	78.9	1.262	1.337	183.1	-15.0	62.9	Approach
1.263	1.315	195.5	4.8	90.4	1.271	1.344	187.6	-13.5	64.5	
1.261	1.312	190.9	.9	96.1	1.261	1.332	190.0	-18.5	61.7	Approach
1.268	1.309	190.7	.9	98.2	1.263	1.333	197.8	-16.4	61.9	
1.271	1.314	191.8	2.1	101.9	1.256	1.325	197.2	-18.8	61.0	Approach
1.276	1.320	187.4	1.9	101.5	1.269	1.326	193.6	-17.9	61.0	
1.288	1.318	188.4	3.9	103.1	1.268	1.326	189.7	-18.9	60.1	Approach
1.279	1.318	188.9	3.6	102.4	1.268	1.331	186.3	-17.4	58.7	
1.279	1.318	192.3	3.7	101.3	1.266	1.329	184.0	-17.7	59.3	Approach
1.271	1.326	192.3	3.1	100.5	1.252	1.325	182.5	-17.9	57.0	
1.256	1.322	189.7	.3	95.6	1.257	1.330	189.1	-17.4	59.4	Approach
1.258	1.324	187.1	-0.6	91.3	1.248	1.319	187.5	-18.3	56.5	
1.259	1.315	188.2	-3.4	86.2	1.260	1.325	192.9	-15.9	61.3	Approach
1.255	1.321	188.2	-1.2	85.7	1.249	1.323	191.8	-17.4	57.9	
1.245	1.310	188.1	-4.4	82.2	1.271	1.331	192.7	-14.7	60.8	Approach
1.242	1.311	193.1	-2.8	80.3	1.249	1.319	188.7	-16.7	56.6	
1.245	1.317	194.9	-2.8	83.6	1.260	1.330	193.4	-13.0	57.9	Approach
1.238	1.320	192.0	-2.8	81.2	1.245	1.322	190.0	-16.1	54.0	
1.249	1.322	189.4	-4.7	79.1	1.257	1.327	191.5	-13.3	56.6	Approach
1.248	1.318	187.6	-6.0	73.9	1.245	1.325	191.4	-16.2	55.3	
1.261	1.323	188.8	-5.6	73.7	1.260	1.334	190.9	-14.1	56.8	Approach
1.255	1.321	187.1	-9.2	66.0	1.265	1.331	184.3	-15.4	59.1	
1.263	1.326	189.8	-8.9	64.6	1.271	1.326	183.0	-14.2	57.7	Approach
1.263	1.324	192.3	-10.1	63.8	1.273	1.327	184.4	-14.2	60.6	
1.261	1.322	193.0	-11.0	61.9	1.260	1.319	185.6	-12.9	60.8	Approach
1.273	1.330	191.2	-10.4	63.6	1.266	1.326	189.6	-12.0	65.0	
1.259	1.326	189.1	-11.6	62.2	1.248	1.322	189.4	-14.2	61.7	Approach
1.271	1.330	188.3	-9.1	64.0	1.261	1.333	182.7	-9.5	64.8	

(Continued)

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Table 3 (Continued)

Test No. 33; 25-deg yaw angle										
V_w m/sec	V_c m/sec	W N	B N	S N	V_w m/sec	V_c m/sec	W N	B N	S N	
1.087	1.241	186.2	8.4	61.7	1.098	1.309	186.6	1.8	100.1	
1.092	1.248	186.2	6.0	61.7	1.105	1.305	186.7	1.3	98.7	
1.102	1.264	186.5	5.5	53.8	1.110	1.307	187.4	2.7	96.3	
1.118	1.281	186.9	7.2	57.5	1.111	1.309	186.9	.4	94.5	
1.116	1.289	186.2	8.1	52.6	1.106	1.311	186.7	1.3	97.2	
1.110	1.287	187.3	9.9	47.5	1.111	1.313	187.2	1.0	101.2	
1.108	1.289	187.1	10.2	46.8	1.115	1.314	186.5	1.9	104.9	
1.102	1.286	186.5	10.8	50.1	1.110	1.317	185.6	.7	110.7	
1.095	1.281	187.3	9.4	52.4	1.106	1.314	185.6	.3	111.2	
1.102	1.280	187.3	11.1	53.3	1.106	1.308	186.0	-.1	109.1	
1.109	1.283	186.5	9.7	55.6	1.101	1.306	186.0	.4	105.8	
1.132	1.285	186.9	11.4	59.8	1.088	1.310	185.7	-.4	104.0	
1.133	1.288	187.3	10.2	59.3	1.085	1.307	186.6	.4	100.3	
1.140	1.290	186.5	11.2	52.6	1.074	1.304	186.3	.3	100.1	
1.141	1.293	186.7	12.0	52.4	1.069	1.303	186.3	-1.0	100.3	
1.152	1.292	186.2	12.1	58.2	1.073	1.310	185.8	-.1	101.0	
1.141	1.291	185.8	13.6	62.8	1.073	1.309	186.2	0.0	101.0	
1.149	1.292	186.0	12.7	60.7	1.085	1.314	186.3	-.9	102.1	
1.149	1.294	185.3	10.3	55.2	1.101	1.317	186.5	.9	102.3	
1.151	1.296	185.7	11.1	54.5	1.108	1.318	186.5	2.2	101.2	
1.142	1.299	186.4	12.3	56.3	1.111	1.316	186.3	2.5	101.6	
1.144	1.301	186.5	11.2	55.0	1.112	1.314	186.5	2.4	99.4	
1.149	1.299	186.6	15.0	54.2	1.106	1.312	186.5	1.6	99.1	
1.152	1.297	186.8	17.7	61.9	1.102	1.308	185.8	.4	99.4	
1.154	1.294	186.1	16.8	68.0	1.095	1.307	186.7	1.9	102.3	
1.155	1.300	186.3	17.2	70.8	1.093	1.306	186.6	.7	104.4	
1.142	1.303	186.4	14.1	67.0	1.091	1.307	186.8	.9	105.1	
1.137	1.309	186.5	14.4	60.3	1.091	1.309	186.8	2.8	105.4	
1.135	1.311	186.7	15.7	60.3	1.083	1.310	187.3	2.1	103.7	
1.119	1.312	186.7	13.3	62.9	1.090	1.314	186.8	2.4	101.2	
1.119	1.310	186.9	12.4	64.9	1.090	1.314	186.2	.6	97.3	
1.120	1.307	186.2	15.9	78.0	1.105	1.314	186.2	.4	99.1	
1.124	1.302	186.0	16.3	105.4	1.117	1.315	186.2	-.6	99.8	
1.126	1.304	185.8	16.6	131.6	1.121	1.312	185.6	.1	101.7	
1.132	1.306	185.5	17.2	143.7	1.126	1.312	185.5	-1.8	102.3	
1.141	1.304	185.8	16.8	147.7	1.127	1.310	186.0	.9	102.8	
1.161	1.307	186.2	13.0	147.5	1.126	1.310	186.6	.7	100.5	
1.156	1.304	186.2	15.6	141.7	1.122	1.311	186.5	.6	98.9	
1.161	1.300	186.8	15.6	135.2	1.125	1.311	187.4	1.3	96.8	
1.166	1.299	186.5	17.1	135.8	1.115	1.310	187.5	.4	94.7	
1.163	1.294	186.0	18.6	140.0	1.111	1.308	187.5	-.4	94.5	
1.155	1.291	186.4	15.6	143.5	1.106	1.306	186.7	.1	93.7	
1.162	1.295	186.4	15.0	146.3	1.103	1.305	186.7	.3	92.6	
1.160	1.299	186.4	12.4	144.7	1.110	1.308	186.9	.1	93.0	
1.156	1.301	186.2	12.9	139.5	1.112	1.306	185.8	0.0	90.1	
1.136	1.298	186.1	10.9	133.3	1.106	1.307	185.8	-.1	89.3	
1.123	1.300	186.1	9.1	127.0	1.106	1.307	186.0	.6	88.9	
1.106	1.302	185.1	9.9	125.6	1.098	1.313	185.8	0.0	88.0	
1.098	1.304	185.7	9.9	124.4	1.094	1.313	185.7	-.7	84.9	
1.098	1.305	186.7	8.1	126.8	1.083	1.315	186.0	-.3	84.0	
1.100	1.305	186.6	6.6	128.4	1.085	1.316	186.3	-1.8	80.8	
1.108	1.309	186.3	8.1	131.0	1.070	1.322	185.6	-3.0	78.6	
1.106	1.307	187.3	7.0	130.2	1.065	1.315	185.2	-2.8	75.6	
1.106	1.308	187.3	5.2	125.4	1.062	1.316	185.0	-4.0	73.8	
1.111	1.307	186.3	3.7	118.0	1.062	1.316	185.4	-5.7	73.1	
1.111	1.314	186.4	3.6	111.4	1.062	1.314	185.4	-4.0	72.9	
1.101	1.313	186.7	2.5	105.6	1.066	1.305	185.7	-6.0	71.2	
1.096	1.310	186.0	.9	100.5	1.068	1.306	186.9	-7.0	70.7	
1.096	1.310	185.7	2.7	101.6	1.061	1.306	186.7	-5.7	71.9	
1.095	1.313	186.3	1.9	101.2	1.068	1.304	187.1	-2.2	75.6	

(Continued)

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Table 3 (Continued)

Test No. 34; 25-deg yaw angle									
V_w m/sec	V_c m/sec	W N	B N	S N	V_w m/sec	V_c m/sec	W N	B N	S N
1.140	1.242	367.9	12.3	116.3	1.113	1.318	366.7	-17.9	191.7
1.153	1.264	368.8	14.3	116.1	1.116	1.316	367.7	-15.9	192.9
1.159	1.282	369.0	14.6	110.2	1.117	1.313	367.0	-16.7	193.3
1.170	1.291	368.1	12.4	103.5	1.117	1.316	368.1	-17.9	192.9
1.176	1.300	368.9	12.9	98.3	1.119	1.310	367.1	-18.1	193.1
1.164	1.304	368.0	14.0	106.8	1.114	1.312	367.2	-16.6	193.6
1.173	1.303	367.1	15.0	104.0	1.116	1.317	367.6	-18.1	194.0
1.188	1.306	367.8	17.8	101.2	1.110	1.318	367.6	-17.3	194.5
1.188	1.306	367.3	19.0	105.3	1.116	1.319	367.6	-14.9	195.7
1.199	1.302	367.3	21.1	114.5	1.119	1.318	367.4	-16.7	197.3
1.208	1.299	367.3	21.4	116.1	1.0<4	1.314	367.6	-16.7	198.7
1.203	1.301	367.1	19.8	110.2	1.122	1.317	366.5	-16.4	201.1
1.203	1.308	367.8	18.8	106.5	1.0<4	1.312	366.5	-16.3	199.9
1.212	1.308	367.4	17.8	117.0	1.125	1.316	366.7	-17.5	200.6
1.206	1.308	367.6	15.6	118.7	1.118	1.321	366.7	-17.8	198.7
1.201	1.315	367.7	15.6	111.7	1.122	1.325	367.8	-15.6	199.2
1.205	1.310	367.3	19.0	110.5	1.116	1.322	367.8	-17.5	196.9
1.198	1.308	367.8	17.6	125.9	1.116	1.327	368.3	-17.5	198.2
1.209	1.313	368.1	18.5	131.0	1.118	1.327	367.0	-16.3	200.1
1.207	1.317	367.8	19.8	125.6	1.120	1.322	367.6	-16.3	202.0
1.212	1.317	367.8	18.1	120.8	1.120	1.324	366.5	-17.5	204.5
1.212	1.319	367.9	15.8	129.9	1.122	1.319	366.2	-16.6	204.5
1.216	1.318	367.4	18.5	132.9	1.132	1.327	367.2	-15.2	208.0
1.203	1.322	367.4	19.6	124.5	1.121	1.331	367.2	-17.3	205.3
1.204	1.319	367.4	20.7	121.4	1.130	1.338	368.4	-14.3	206.0
1.201	1.315	367.6	24.0	129.6	1.127	1.339	368.3	-14.6	204.8
1.201	1.315	367.3	23.9	133.1	1.130	1.345	369.0	-12.6	205.2
1.186	1.310	366.6	21.9	135.2	1.127	1.343	367.4	-12.7	204.6
1.173	1.298	366.7	23.3	139.6	1.133	1.335	368.0	-12.4	205.7
1.170	1.298	366.0	21.7	148.0	1.135	1.334	367.2	-13.2	207.8
1.176	1.301	366.6	19.3	163.0	1.131	1.334	367.2	-14.4	208.3
1.170	1.301	366.6	19.5	184.0	1.138	1.334	367.6	-13.1	212.7
1.173	1.298	366.6	21.4	204.6	1.127	1.325	367.3	-15.5	210.6
1.172	1.300	366.6	21.1	224.9	1.139	1.332	367.8	-12.9	213.6
1.163	1.298	367.0	20.8	245.8	1.123	1.326	366.8	-15.6	213.0
1.166	1.302	367.9	23.1	263.4	1.122	1.324	367.7	-12.3	214.6
1.169	1.306	368.0	24.5	265.9	1.120	1.326	367.1	-15.0	213.9
1.172	1.308	367.9	22.8	261.7	1.126	1.329	367.8	-14.7	215.7
1.186	1.314	368.4	25.2	267.8	1.118	1.332	367.3	-14.9	215.1
1.190	1.319	367.1	24.9	267.8	1.113	1.332	367.4	-14.4	211.6
1.190	1.317	366.7	24.2	262.9	1.118	1.333	368.2	-13.7	211.5
1.185	1.318	366.7	20.1	262.0	1.116	1.327	367.9	-13.7	210.4
1.166	1.324	366.8	19.0	261.7	1.111	1.321	367.9	-11.7	209.0
1.150	1.324	366.7	9.9	251.0	1.111	1.316	367.4	-12.9	209.9
1.139	1.324	367.6	9.9	242.1	1.120	1.313	367.4	-12.3	209.7
1.131	1.325	367.1	5.9	231.2	1.120	1.312	366.1	-12.7	208.3
1.122	1.320	367.2	1.2	217.9	1.111	1.315	366.3	-13.4	202.0
1.133	1.316	367.6	-1.5	209.9	1.117	1.327	367.7	-13.8	198.5
1.129	1.313	367.0	-2.7	208.0	1.120	1.322	367.6	-15.9	188.7
1.116	1.313	367.2	-8.2	208.3	1.131	1.332	368.5	-15.0	185.4
1.097	1.312	367.0	-10.2	208.8	1.128	1.333	368.2	-19.8	177.4
1.089	1.316	367.0	-9.5	209.7	1.147	1.338	368.9	-20.2	172.3
1.084	1.322	367.2	-11.1	208.8	1.146	1.332	367.4	-22.0	166.0
1.085	1.319	367.2	-12.0	204.1	1.131	1.334	368.1	-23.7	161.3
1.108	1.321	367.7	-9.5	204.5	1.112	1.332	367.2	-26.8	157.1
1.118	1.322	367.3	-9.9	203.4	1.107	1.332	367.3	-25.4	154.4
1.126	1.321	367.2	-10.9	201.3	1.082	1.329	366.3	-25.8	153.4
1.127	1.320	366.8	-13.8	197.5	1.066	1.329	366.1	-25.4	153.2
1.122	1.318	366.8	-13.5	197.3	1.077	1.329	365.9	-15.5	164.8
1.116	1.324	367.0	-14.6	194.9	1.081	1.327	365.7	-9.5	163.0

(Continued)

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Table 3 (Continued)

Test No. 35 ; 10-deg yaw angle										
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N	
1.253	1.253	364.6	11.2	121.2	1.257	1.340	364.2	-24.2	123.5	
1.275	1.272	364.8	8.1	113.8	1.264	1.343	364.4	-18.1	127.1	
1.306	1.298	364.0	10.2	113.8	1.261	1.341	363.9	-20.4	127.7	
1.318	1.317	363.6	7.9	106.8	1.264	1.342	363.3	-17.0	129.2	
1.327	1.326	363.8	11.3	109.5	1.277	1.342	363.7	-15.6	130.5	
1.334	1.331	364.5	15.9	113.8	1.277	1.337	364.2	-16.1	131.5	
1.331	1.330	364.8	17.2	120.7	1.279	1.334	364.5	-18.5	130.8	
1.332	1.327	365.0	17.2	119.6	1.284	1.333	364.2	-16.4	131.7	
1.323	1.322	365.0	19.0	121.9	1.280	1.331	364.4	-19.5	130.8	
1.317	1.317	364.6	18.1	122.4	1.273	1.333	363.8	-19.3	129.8	
1.319	1.319	364.4	17.6	124.5	1.281	1.341	364.1	-20.1	129.4	
1.319	1.321	364.0	16.1	122.2	1.232	1.343	364.4	-19.2	131.0	
1.307	1.320	364.1	16.7	120.0	1.279	1.348	364.5	-17.9	131.9	
1.310	1.321	364.1	15.3	118.0	1.279	1.345	365.1	-18.1	131.5	
1.316	1.327	364.7	17.0	120.5	1.282	1.344	365.0	-17.2	133.3	
1.314	1.330	364.4	15.5	120.0	1.280	1.344	364.2	-15.2	134.3	
1.313	1.324	364.6	18.1	124.7	1.283	1.344	364.5	-16.8	135.0	
1.308	1.325	364.5	15.8	129.1	1.284	1.345	364.5	-17.5	134.3	
1.307	1.327	364.2	18.4	134.7	1.281	1.350	364.4	-16.1	134.1	
1.303	1.325	363.7	19.0	131.0	1.272	1.350	365.0	-17.9	133.4	
1.306	1.321	363.5	19.3	132.2	1.266	1.350	365.1	-17.9	134.0	
1.311	1.326	363.6	21.3	134.0	1.260	1.352	365.0	-17.2	135.4	
1.331	1.326	364.5	24.1	137.8	1.258	1.348	364.9	-16.8	136.9	
1.341	1.324	364.5	23.0	136.6	1.259	1.347	364.4	-14.4	139.4	
1.357	1.323	364.6	23.6	139.4	1.266	1.346	363.7	-13.5	140.8	
1.353	1.321	365.0	24.8	141.1	1.283	1.348	364.4	-13.2	145.5	
1.346	1.324	364.7	22.5	139.7	1.281	1.345	364.7	-13.2	143.9	
1.344	1.324	364.0	21.0	135.2	1.288	1.346	364.9	-12.7	144.1	
1.336	1.321	364.1	19.3	127.7	1.287	1.343	364.8	-15.3	143.2	
1.323	1.323	364.1	18.8	122.9	1.282	1.342	365.0	-13.8	142.9	
1.310	1.327	364.4	13.5	111.4	1.271	1.340	364.4	-16.2	137.3	
1.315	1.328	364.1	5.9	115.2	1.277	1.341	363.7	-14.4	137.6	
1.304	1.330	363.9	2.7	122.8	1.275	1.342	364.0	-15.8	137.1	
1.295	1.329	363.8	1.0	135.4	1.284	1.348	364.4	-16.7	138.2	
1.288	1.330	364.1	-5.2	149.4	1.286	1.348	364.8	-18.2	138.3	
1.286	1.327	363.7	-5.3	168.4	1.284	1.344	364.8	-17.3	138.7	
1.269	1.328	363.8	-2.4	172.1	1.280	1.346	365.6	-19.3	137.6	
1.266	1.330	363.9	-2.7	173.5	1.276	1.342	365.0	-18.1	136.6	
1.272	1.337	363.9	-1.2	177.4	1.280	1.345	365.3	-17.8	137.1	
1.275	1.343	363.6	1.3	178.1	1.282	1.348	364.8	-17.9	135.7	
1.276	1.338	363.8	2.7	176.1	1.284	1.350	364.7	-17.5	137.3	
1.296	1.341	364.4	5.2	182.1	1.276	1.345	363.8	-18.2	137.1	
1.296	1.337	364.0	5.5	188.7	1.276	1.350	364.5	-17.8	137.1	
1.289	1.336	364.0	3.2	187.9	1.262	1.346	363.9	-18.5	135.4	
1.284	1.331	363.9	1.8	179.1	1.264	1.345	364.5	-16.2	136.8	
1.282	1.338	363.6	.4	169.0	1.258	1.345	365.0	-15.3	136.1	
1.264	1.337	363.3	-5.3	149.9	1.266	1.346	365.0	-14.1	136.9	
1.262	1.337	363.5	-7.9	133.1	1.276	1.342	364.9	-15.2	136.9	
1.265	1.337	363.7	-12.2	124.3	1.285	1.342	364.8	-12.7	136.2	
1.266	1.327	364.2	-14.7	122.9	1.283	1.346	364.8	-15.6	132.7	
1.269	1.328	364.7	-18.8	120.5	1.284	1.348	364.1	-18.1	129.6	
1.272	1.328	364.6	-18.2	120.5	1.290	1.352	364.6	-17.0	127.1	
1.275	1.328	364.6	-19.5	122.2	1.293	1.352	364.1	-18.1	126.1	
1.273	1.327	365.2	-18.7	122.4	1.288	1.349	364.5	-19.6	124.5	
1.280	1.332	365.2	-19.0	123.5	1.291	1.350	363.9	-18.8	126.4	
1.282	1.340	365.1	-15.6	125.9	1.297	1.347	364.5	-17.9	127.0	
1.278	1.339	364.8	-20.1	125.0	1.301	1.347	363.7	-18.4	128.2	
1.273	1.344	365.2	-20.2	125.0	1.299	1.347	363.8	-15.6	129.2	
1.275	1.346	365.0	-20.4	125.7	1.306	1.354	363.8	-10.5	136.1	
1.263	1.344	364.6	-22.5	124.9	1.310	1.351	364.4	-5.5	142.2	

(Continued)

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Table 3 (Continued)

Test No. 36 ; 5-deg yaw angle										
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N	
1.283	1.257	363.7	26.5	130.0	1.279	1.303	357.1	-15.2	88.8	Approach
1.296	1.276	367.3	25.6	127.3	1.283	1.307	357.3	-15.2	90.2	
1.311	1.286	369.8	22.9	120.3	1.286	1.308	361.1	-15.5	92.3	Approach
1.325	1.295	370.2	24.2	119.6	1.294	1.308	364.6	-15.0	93.7	
1.334	1.299	363.8	25.1	120.7	1.305	1.308	365.8	-13.8	96.7	Approach
1.338	1.305	357.6	23.5	120.5	1.314	1.312	371.6	-14.3	97.2	
1.340	1.306	355.9	23.5	117.3	1.311	1.310	376.7	-14.0	97.7	Approach
1.334	1.311	358.3	27.1	121.5	1.307	1.306	373.4	-14.3	96.1	
1.326	1.305	361.5	26.6	121.5	1.305	1.308	367.6	-13.1	95.4	Approach
1.319	1.301	365.9	27.8	122.4	1.291	1.308	367.4	-15.9	92.5	
1.317	1.296	372.0	28.3	124.5	1.291	1.313	367.9	-15.9	91.8	Approach
1.312	1.294	369.9	27.7	128.0	1.292	1.311	363.9	-17.6	91.5	
1.323	1.292	364.1	28.1	127.3	1.290	1.310	358.9	-17.9	89.7	Approach
1.335	1.298	364.7	28.6	130.0	1.296	1.312	360.4	-18.5	90.0	
1.338	1.298	369.6	28.3	128.5	1.299	1.309	360.1	-17.0	90.6	Approach
1.346	1.299	371.5	29.0	130.0	1.292	1.305	358.1	-18.3	92.7	
1.347	1.298	371.0	30.8	130.7	1.297	1.309	357.8	-17.1	90.7	Approach
1.341	1.298	374.2	28.9	133.7	1.304	1.317	360.6	-17.1	90.7	
1.329	1.296	372.8	28.4	138.4	1.292	1.316	364.6	-18.8	88.3	Approach
1.332	1.298	367.9	26.3	141.3	1.294	1.320	367.9	-18.3	88.8	
1.330	1.300	361.9	25.9	137.9	1.293	1.317	369.4	-18.3	86.9	Approach
1.341	1.299	363.4	25.1	136.1	1.296	1.314	371.1	-18.8	88.8	
1.352	1.301	366.1	25.7	137.7	1.289	1.308	368.9	-17.6	89.2	Approach
1.359	1.303	369.5	25.4	136.7	1.309	1.316	367.2	-15.2	93.5	
1.357	1.300	370.4	26.6	136.8	1.317	1.313	368.8	-15.8	95.8	Approach
1.352	1.297	369.4	27.2	139.1	1.329	1.322	365.8	-12.9	98.6	
1.347	1.297	365.1	27.2	139.8	1.323	1.321	360.5	-12.5	99.1	Approach
1.340	1.295	362.7	27.2	139.8	1.321	1.322	365.5	-12.3	100.3	
1.338	1.296	357.2	27.4	139.6	1.319	1.319	366.7	-12.3	99.8	Approach
1.332	1.300	352.2	26.8	137.2	1.321	1.323	359.8	-12.2	97.9	
1.332	1.304	356.0	22.0	137.3	1.322	1.324	359.2	-13.7	96.0	Approach
1.327	1.302	369.8	15.0	137.9	1.324	1.326	363.9	-14.1	95.8	
1.323	1.302	370.0	10.5	137.7	1.329	1.320	364.2	-15.2	95.6	Approach
1.317	1.301	365.0	6.3	138.6	1.323	1.314	362.4	-14.7	93.7	
1.321	1.300	369.9	2.8	144.8	1.315	1.313	365.3	-14.9	94.4	Approach
1.323	1.298	375.6	3.0	147.4	1.301	1.306	366.9	-16.2	95.1	
1.327	1.303	365.6	4.0	150.2	1.296	1.305	367.3	-14.3	94.7	Approach
1.327	1.304	361.9	6.3	152.7	1.291	1.307	368.1	-15.2	94.7	
1.327	1.305	368.2	6.4	154.9	1.280	1.311	367.4	-16.2	93.2	Approach
1.332	1.311	368.2	8.8	157.9	1.290	1.313	369.1	-15.5	92.1	
1.325	1.312	360.0	9.7	163.1	1.289	1.311	371.6	-14.9	91.4	Approach
1.327	1.315	357.8	11.4	165.5	1.286	1.312	369.9	-14.6	92.7	
1.322	1.317	362.5	8.5	165.7	1.285	1.310	367.0	-14.6	90.7	Approach
1.317	1.319	366.1	7.3	162.6	1.297	1.313	363.4	-13.1	93.2	
1.315	1.319	368.4	5.8	157.2	1.288	1.308	359.6	-12.3	94.0	Approach
1.313	1.322	369.5	4.3	149.0	1.298	1.309	362.6	-11.4	97.2	
1.305	1.322	364.9	2.2	138.7	1.307	1.313	364.7	-13.2	97.9	Approach
1.297	1.320	362.4	-7.7	124.3	1.315	1.322	362.0	-10.5	101.3	
1.307	1.319	366.7	-2.4	113.7	1.313	1.321	365.8	-11.6	102.9	Approach
1.305	1.313	366.8	-7.0	102.4	1.315	1.327	369.8	-11.3	104.1	
1.307	1.310	371.2	-9.9	93.2	1.313	1.330	365.2	-9.7	103.4	Approach
1.300	1.303	375.5	-13.4	86.9	1.311	1.325	361.5	-9.7	102.2	
1.307	1.301	376.8	-13.8	86.7	1.309	1.320	367.3	-11.6	102.4	Approach
1.296	1.302	369.6	-15.3	86.0	1.310	1.315	369.5	-11.3	100.1	
1.302	1.308	369.8	-14.6	87.8	1.320	1.314	371.1	-12.8	100.7	Approach
1.307	1.309	366.0	-14.0	89.0	1.326	1.310	368.9	-13.1	100.5	
1.309	1.312	365.1	-12.8	89.5	1.337	1.315	371.6	-11.3	103.4	Approach
1.312	1.315	364.2	-12.2	90.2	1.337	1.317	369.6	-10.0	107.4	
1.302	1.310	362.8	-13.8	90.6	1.341	1.320	361.5	-4.3	114.9	Approach
1.290	1.308	359.8	-14.9	89.5	1.329	1.313	348.1	1.9	119.3	

(Continued)

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Table 3 (Continued)

Test No. 37; 5-deg yaw angle										
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N	
2.183	2.193	291.5	2.8	104.8	2.068	2.164	271.2	-22.3	78.2	Approach
2.143	2.164	290.4	3.8	101.9	2.062	2.156	272.2	-21.3	78.0	
2.141	2.164	293.1	5.4	100.7	2.060	2.150	272.4	-19.6	78.7	
2.133	2.167	291.3	5.9	97.7	2.063	2.162	276.4	-17.2	78.0	
2.122	2.158	289.3	10.5	98.4	2.077	2.164	278.6	-16.1	77.3	
2.098	2.146	275.5	13.7	94.9	2.061	2.158	279.9	-17.2	75.6	
2.102	2.137	266.0	12.3	92.4	2.045	2.146	281.1	-19.8	74.0	
2.097	2.140	255.5	8.9	91.0	2.037	2.142	283.1	-21.6	72.4	
2.105	2.144	249.6	5.1	88.8	2.035	2.140	285.2	-22.2	71.8	
2.105	2.133	257.1	.1	85.6	2.043	2.151	283.8	-19.1	73.8	
2.117	2.133	279.3	-.1	93.3	2.036	2.146	279.6	-17.0	74.7	
2.133	2.142	304.6	2.4	100.2	2.060	2.161	273.2	-15.9	76.1	
2.156	2.142	318.9	8.2	107.6	2.071	2.167	271.3	-15.3	75.0	
2.160	2.143	317.1	15.0	107.2	2.075	2.165	269.5	-16.4	74.3	
2.160	2.150	295.8	18.2	106.5	2.063	2.161	271.5	-19.8	74.3	
2.142	2.150	268.9	16.9	93.1	2.080	2.174	278.8	-21.3	75.2	
2.114	2.144	246.8	15.8	89.9	2.077	2.174	286.5	-21.9	74.5	
2.090	2.150	241.4	12.7	87.2	2.079	2.173	289.8	-22.0	74.7	
2.087	2.152	251.9	10.5	94.9	2.076	2.176	288.8	-21.1	75.9	
2.096	2.158	276.3	12.4	104.2	2.085	2.169	286.6	-19.9	75.0	
2.117	2.161	296.8	15.9	118.8	2.082	2.166	278.7	-18.8	75.0	
2.145	2.180	307.2	17.0	122.3	2.082	2.173	274.4	-17.9	74.5	
2.158	2.181	305.5	16.7	122.7	2.074	2.182	271.1	-18.7	75.4	
2.151	2.172	290.8	14.9	114.0	2.077	2.179	270.6	-20.4	76.1	
2.148	2.175	272.7	11.5	102.8	2.070	2.182	269.7	-22.7	75.4	
2.143	2.192	264.2	10.9	96.8	2.071	2.182	273.6	-24.5	73.8	
2.135	2.187	262.1	10.0	97.9	2.070	2.181	276.4	-23.7	73.6	
2.142	2.190	260.7	8.6	95.6	2.091	2.183	277.7	-21.0	73.6	
2.153	2.197	268.5	7.1	97.0	2.094	2.198	280.6	-18.1	71.7	
2.158	2.200	273.6	7.9	100.9	2.111	2.212	284.4	-16.4	70.1	
2.170	2.199	272.5	4.5	102.8	2.120	2.220	290.0	-15.2	69.9	
2.178	2.201	277.9	1.3	103.5	2.122	2.222	287.6	-14.6	71.7	
2.181	2.208	289.3	.6	111.3	2.118	2.231	282.3	-14.3	73.8	
2.185	2.219	297.4	2.4	120.7	2.128	2.237	272.3	-15.3	75.6	
2.191	2.219	303.7	3.0	128.5	2.135	2.234	265.2	-14.4	76.3	
2.188	2.218	303.8	4.7	135.4	2.142	2.243	260.0	-14.4	76.4	
2.179	2.220	290.7	6.0	131.9	2.153	2.253	265.1	-16.7	77.1	
2.168	2.223	277.0	5.9	123.5	2.152	2.246	274.7	-20.1	73.8	
2.163	2.214	266.9	4.1	118.2	2.154	2.241	285.7	-22.3	72.7	
2.156	2.213	264.9	2.2	116.3	2.157	2.242	295.9	-24.2	74.5	
2.156	2.212	267.9	1.2	117.2	2.153	2.244	298.3	-22.0	77.9	
2.163	2.208	275.0	2.7	126.7	2.154	2.234	291.1	-21.1	76.8	
2.166	2.198	278.3	3.6	135.2	2.155	2.234	281.2	-21.1	77.0	
2.159	2.204	277.7	4.4	140.0	2.142	2.235	275.9	-19.6	76.4	
2.151	2.205	275.5	7.6	136.5	2.127	2.232	268.8	-18.1	75.7	
2.139	2.206	274.8	6.8	129.9	2.132	2.228	265.7	-20.8	74.0	
2.129	2.208	280.9	1.9	120.0	2.125	2.224	267.7	-20.5	72.4	
2.117	2.205	283.5	-2.1	109.4	2.115	2.218	271.7	-19.9	70.9	
2.120	2.202	282.0	-6.0	98.0	2.124	2.208	277.6	-19.3	71.7	
2.119	2.206	278.8	-12.4	89.5	2.134	2.213	280.9	-18.1	71.7	
2.121	2.199	279.2	-15.2	83.7	2.126	2.209	283.1	-18.4	70.1	
2.120	2.199	276.4	-14.6	80.2	2.132	2.207	284.3	-21.0	69.9	
2.118	2.199	279.3	-14.6	78.4	2.128	2.201	287.2	-22.3	70.6	
2.104	2.188	283.9	-14.9	77.3	2.115	2.201	282.7	-23.1	70.6	
2.109	2.183	287.0	-15.0	77.7	2.109	2.192	275.4	-24.9	72.0	
2.107	2.184	287.0	-14.4	77.7	2.105	2.188	270.4	-25.7	74.1	
2.107	2.184	285.1	-15.0	78.0	2.098	2.184	267.4	-25.7	74.5	
2.109	2.190	281.1	-15.2	79.8	2.101	2.188	266.5	-23.3	75.2	
2.107	2.185	276.0	-17.5	80.9	2.111	2.188	267.0	-15.0	79.8	
2.074	2.169	273.8	-21.1	79.3	2.111	2.185	266.7	-5.0	88.8	

(Continued)

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Table 3 (Continued)

Test No. 38; 10-deg yaw angle									
V_w m/sec	V_c m/sec	W N	B N	S N	V_w m/sec	V_c m/sec	W N	B N	S N
2.087	2.097	280.9	10.4	99.6	2.082	2.194	283.5	-16.0	97.2
2.138	2.161	285.4	14.0	92.9	2.090	2.203	282.6	-14.9	98.2
2.131	2.163	282.4	16.4	89.3	2.077	2.196	275.8	-14.3	95.6
2.114	2.156	278.1	14.9	80.3	2.064	2.192	270.0	-11.0	91.7
2.117	2.171	284.3	17.0	89.4	2.069	2.196	267.9	-11.0	89.4
2.125	2.181	271.7	19.4	88.0	2.066	2.197	268.1	-13.7	88.4
2.123	2.175	258.2	17.8	90.5	2.057	2.180	267.2	-19.3	86.7
2.096	2.171	254.5	14.8	82.5	2.064	2.164	270.2	-22.4	86.1
2.087	2.174	252.9	10.7	87.5	2.071	2.171	273.4	-25.1	87.5
2.081	2.167	255.4	8.0	85.6	2.074	2.175	277.8	-25.4	88.4
2.083	2.163	261.8	6.8	88.6	2.070	2.169	277.5	-25.1	87.0
2.091	2.160	270.8	8.6	93.7	2.064	2.169	277.5	-21.7	86.3
2.109	2.154	280.7	6.8	98.2	2.052	2.171	277.9	-18.7	86.0
2.128	2.150	289.9	10.7	105.1	2.045	2.170	279.3	-18.5	85.8
2.129	2.140	294.0	13.3	103.0	2.042	2.163	277.9	-16.7	87.5
2.128	2.137	294.6	13.7	106.8	2.035	2.159	272.4	-15.1	89.1
2.123	2.141	291.8	12.8	102.7	2.017	2.159	268.1	-16.6	88.9
2.121	2.145	282.3	13.0	106.1	2.026	2.162	267.4	-16.3	86.8
2.105	2.145	274.4	8.3	96.3	2.037	2.156	267.1	-14.2	88.0
2.091	2.142	269.8	5.0	100.5	2.033	2.152	267.8	-12.8	89.6
2.063	2.133	269.8	4.4	94.6	2.033	2.152	273.0	-12.8	91.5
2.057	2.121	274.8	7.0	101.1	2.044	2.144	279.2	-13.7	91.8
2.057	2.115	288.7	11.9	95.1	2.030	2.136	280.0	-17.5	93.9
2.078	2.118	293.4	18.4	104.9	2.025	2.127	281.0	-20.5	94.6
2.097	2.132	290.8	22.0	95.3	2.016	2.124	277.2	-24.5	93.9
2.111	2.135	281.2	20.6	98.9	2.006	2.119	276.5	-25.3	92.9
2.096	2.127	271.6	15.4	84.1	2.016	2.121	273.2	-23.6	95.6
2.070	2.121	261.3	10.3	82.9	2.024	2.136	273.8	-20.5	97.9
2.035	2.113	260.9	5.9	71.0	2.015	2.141	270.2	-19.4	96.8
2.028	2.103	264.7	6.2	83.6	2.008	2.133	270.5	-17.9	92.7
2.028	2.113	265.8	4.9	87.5	2.007	2.128	269.3	-16.1	91.1
2.032	2.114	262.2	4.4	103.9	2.002	2.129	270.3	-11.9	91.1
2.049	2.120	260.3	5.2	116.1	2.006	2.129	270.6	-8.2	92.4
2.064	2.122	260.4	5.6	134.6	2.011	2.131	270.6	-6.2	93.2
2.060	2.120	269.3	3.5	141.5	2.016	2.132	271.6	-8.6	93.7
2.060	2.115	285.9	8.9	151.1	2.008	2.128	272.1	-12.4	91.0
2.070	2.121	298.8	13.6	158.4	1.997	2.124	276.0	-15.5	89.1
2.081	2.130	302.5	16.7	164.8	1.992	2.124	276.4	-17.9	88.7
2.087	2.131	299.6	17.6	166.5	2.004	2.126	277.8	-18.4	90.8
2.080	2.129	288.0	15.4	165.5	2.005	2.131	275.8	-16.3	93.7
2.068	2.126	270.1	10.1	157.2	2.019	2.135	273.6	-15.4	96.3
2.056	2.124	260.7	6.7	150.3	2.017	2.131	269.3	-17.2	94.4
2.048	2.119	254.1	6.1	146.5	2.022	2.129	268.9	-18.2	93.7
2.053	2.131	251.6	7.1	147.3	2.019	2.132	272.6	-17.8	96.0
2.051	2.141	254.3	10.6	148.7	2.028	2.147	275.8	-17.2	101.0
2.049	2.147	263.0	9.1	150.8	2.033	2.153	280.3	-16.7	104.3
2.046	2.141	269.4	6.2	148.2	2.042	2.158	280.6	-16.7	107.0
2.040	2.139	276.9	2.0	141.1	2.038	2.160	279.1	-16.7	107.5
2.032	2.143	282.9	-2.6	126.8	2.036	2.163	274.1	-16.3	105.5
2.032	2.148	285.0	-11.9	112.5	2.040	2.159	271.3	-16.7	101.5
2.033	2.143	286.8	-13.1	99.3	2.032	2.163	267.6	-16.7	97.7
2.042	2.157	286.1	-18.1	91.1	2.030	2.164	267.3	-16.0	95.8
2.053	2.172	281.2	-17.2	86.5	2.037	2.169	267.1	-13.6	98.0
2.049	2.170	273.5	-17.6	85.5	2.051	2.182	268.5	-12.5	101.0
2.051	2.172	268.2	-16.7	84.4	2.044	2.181	270.2	-15.8	99.6
2.057	2.174	265.5	-12.4	85.3	2.042	2.177	269.3	-16.3	97.4
2.055	2.181	266.0	-12.8	87.2	2.055	2.192	269.6	-14.3	95.5
2.057	2.184	270.8	-16.7	88.9	2.053	2.204	270.3	-13.0	92.4
2.061	2.181	276.7	-19.9	89.8	2.053	2.188	270.9	-9.5	93.0
2.056	2.179	281.1	-17.8	92.7	2.066	2.184	267.0	.8	103.7

(Continued)

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Table 3 (Continued)

Test No. 39; 25-deg yaw angle										
V _w	V _c	W	B	S	V _w	V _c	W	B	S	
m/sec	m/sec	N	N	N	m/sec	m/sec	N	N	N	
1.975	2.235	269.5	16.0	116.3	1.890	2.207	289.1	10.3	170.0	
1.962	2.231	273.6	12.8	90.5	1.878	2.203	285.0	10.8	158.6	
1.941	2.211	290.6	10.3	87.2	1.864	2.200	278.1	10.0	168.6	
1.947	2.217	284.1	9.3	92.6	1.845	2.192	269.5	6.5	164.5	
1.949	2.209	287.0	13.5	86.1	1.829	2.194	265.8	-1.0	156.3	
1.937	2.197	265.0	14.8	81.7	1.824	2.188	266.0	-3.5	150.5	
1.946	2.191	255.0	16.3	88.7	1.823	2.193	270.1	-4.8	150.0	
1.945	2.196	249.6	19.5	79.6	1.827	2.192	275.1	-5.1	150.9	
1.926	2.188	248.0	17.4	85.8	1.832	2.197	279.0	-7.7	150.9	
1.919	2.187	268.2	16.8	91.0	1.834	2.197	283.1	-8.5	153.7	
1.915	2.181	292.5	13.2	95.9	1.837	2.194	283.9	-8.7	158.4	
1.930	2.188	312.0	13.5	106.6	1.840	2.190	283.4	-5.8	163.8	
1.960	2.183	317.4	10.5	104.2	1.830	2.189	280.3	-2.7	168.2	
1.975	2.187	313.8	12.3	112.4	1.819	2.184	279.9	-4.4	171.4	
1.964	2.185	288.6	12.3	93.0	1.816	2.180	277.9	1.6	173.1	
1.947	2.186	259.6	13.7	101.9	1.819	2.192	279.7	2.7	174.5	
1.915	2.178	238.7	14.9	77.5	1.819	2.191	278.6	2.4	174.4	
1.837	2.177	231.4	12.9	93.8	1.828	2.188	278.0	1.2	171.4	
1.879	2.173	247.3	12.6	79.6	1.842	2.191	273.3	2.1	168.8	
1.902	2.163	267.8	12.6	111.9	1.849	2.191	270.7	4.4	166.5	
1.914	2.170	296.9	16.3	98.7	1.839	2.179	266.8	4.8	161.9	
1.940	2.182	307.4	16.0	131.2	1.832	2.170	267.2	3.3	157.7	
1.954	2.183	311.3	20.9	109.8	1.828	2.168	271.1	2.5	156.3	
1.965	2.193	294.8	21.0	130.7	1.821	2.165	280.6	1.9	160.3	
1.942	2.201	284.2	19.5	98.9	1.828	2.167	288.6	-0.9	166.1	
1.931	2.201	266.0	15.1	117.3	1.836	2.170	289.8	-1.8	172.1	
1.920	2.193	267.3	17.4	97.2	1.833	2.178	287.6	-2.2	174.0	
1.920	2.194	266.5	16.6	125.4	1.848	2.186	284.0	-3.5	174.0	
1.931	2.200	273.0	18.1	106.5	1.840	2.191	276.7	-3.9	169.5	
1.958	2.205	269.9	19.7	130.5	1.825	2.198	267.8	-4.1	163.7	
1.972	2.211	265.8	21.3	118.2	1.826	2.198	267.2	-3.6	159.1	
1.981	2.235	261.8	16.4	137.5	1.839	2.205	269.5	-2.1	160.2	
1.916	2.243	264.9	15.5	142.1	1.845	2.208	270.6	-1.1	162.8	
1.910	2.235	267.2	11.1	170.0	1.852	2.210	273.5	-3.3	164.5	
1.964	2.236	278.0	5.9	177.9	1.858	2.207	278.1	0.7	166.0	
1.960	2.242	297.0	2.7	193.7	1.865	2.222	279.7	1.5	166.7	
1.951	2.233	306.8	5.1	192.6	1.867	2.232	280.7	3.3	164.4	
1.933	2.229	306.3	4.8	192.3	1.865	2.232	279.3	1.3	156.8	
1.934	2.229	300.0	9.6	190.0	1.856	2.232	276.7	-0.3	150.9	
1.929	2.232	288.6	15.4	190.9	1.856	2.240	276.2	0.0	148.9	
1.934	2.238	274.2	18.1	191.9	1.851	2.240	279.2	1.0	151.0	
1.931	2.237	261.0	18.3	196.5	1.841	2.231	276.8	-2.9	152.8	
1.941	2.246	255.8	17.7	197.5	1.846	2.233	275.5	-3.2	157.9	
1.935	2.258	253.9	16.8	198.1	1.875	2.243	277.1	-0.3	163.1	
1.938	2.252	264.3	17.5	199.3	1.880	2.245	274.1	-0.9	161.4	
1.935	2.243	275.8	19.7	205.4	1.879	2.245	270.0	-6.2	153.5	
1.937	2.246	285.4	18.3	212.1	1.876	2.246	272.0	-9.7	148.9	
1.927	2.241	291.2	17.1	212.1	1.865	2.249	274.5	-12.9	145.9	
1.909	2.232	294.9	11.9	209.6	1.849	2.248	275.0	-17.4	139.6	
1.899	2.239	290.8	5.6	207.7	1.850	2.246	279.1	-18.7	138.2	
1.893	2.244	285.9	1.5	206.8	1.855	2.249	282.9	-16.3	138.4	
1.887	2.245	276.2	0.4	200.2	1.853	2.253	280.7	-16.3	135.1	
1.884	2.243	267.2	-0.6	189.6	1.854	2.250	278.2	-14.2	129.6	
1.892	2.243	265.0	0.4	179.3	1.859	2.253	276.9	-12.9	128.2	
1.887	2.235	266.2	0.7	171.6	1.853	2.262	273.5	-13.7	124.2	
1.874	2.231	266.8	0.3	163.5	1.836	2.258	268.6	-15.5	117.0	
1.878	2.222	272.7	-0.3	158.9	1.819	2.252	267.5	-13.4	107.5	
1.884	2.222	282.5	0.9	159.5	1.806	2.248	269.0	-14.8	98.9	
1.891	2.220	289.5	4.5	164.7	1.790	2.239	275.8	-10.6	100.3	
1.892	2.213	290.7	9.1	169.3	1.791	2.226	272.5	-4.5	111.0	

(Continued)

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Table 3 (Continued)

Test No. 40; 25-deg yaw angle										
V _w	V _c	W	B	S	V _w	V _c	W	B	S	
m/sec	m/sec	N	N	N	m/sec	m/sec	N	N	N	
2.173	2.421	293.9	3.0	112.5	2.177	2.607	293.6	-16.2	116.6	
2.336	2.602	286.2	3.9	118.4	2.172	2.614	298.9	-13.8	116.5	
2.361	2.637	274.3	-0.9	99.6	2.162	2.609	296.4	-15.0	114.7	
2.333	2.629	271.5	-3.0	114.2	2.152	2.610	294.9	-13.8	112.8	
2.331	2.610	275.8	-1.9	111.6	2.141	2.608	291.3	-13.9	107.4	
2.320	2.607	272.0	-0.9	87.5	2.129	2.602	281.4	-14.8	100.8	
2.314	2.611	271.5	-2.5	92.1	2.119	2.608	272.0	-18.6	100.8	
2.324	2.619	269.3	-1.2	92.9	2.101	2.608	270.6	-18.3	104.8	
2.329	2.617	269.7	.6	91.0	2.100	2.607	267.4	-21.4	106.0	
2.336	2.616	267.8	2.1	92.2	2.106	2.616	267.1	-21.4	107.9	
2.343	2.625	275.3	5.1	91.5	2.103	2.626	269.6	-20.6	106.7	
2.343	2.624	276.8	3.0	87.7	2.096	2.624	271.6	-21.4	98.2	
2.345	2.624	286.7	3.1	93.6	2.098	2.626	274.7	-20.8	92.4	
2.356	2.627	291.1	5.1	96.1	2.106	2.626	276.3	-14.8	93.8	
2.370	2.632	298.2	5.7	99.9	2.101	2.629	276.0	-13.0	95.0	
2.370	2.629	295.7	4.4	99.9	2.097	2.632	275.6	-16.5	99.2	
2.382	2.637	299.4	7.2	105.3	2.111	2.639	281.5	-14.1	105.0	
2.384	2.642	288.7	8.2	106.9	2.132	2.648	284.2	-15.9	104.8	
2.370	2.642	276.8	5.3	101.3	2.127	2.653	285.0	-23.0	99.6	
2.364	2.647	265.7	4.7	102.5	2.129	2.658	287.0	-24.4	99.9	
2.380	2.650	264.1	7.1	105.7	2.143	2.656	289.8	-18.9	101.6	
2.377	2.646	263.3	7.7	107.1	2.129	2.650	286.3	-19.4	100.9	
2.382	2.643	276.5	9.8	114.4	2.117	2.645	282.8	-22.1	101.1	
2.405	2.653	287.8	14.5	125.7	2.127	2.662	280.7	-19.1	105.0	
2.414	2.652	295.9	13.0	126.1	2.138	2.664	278.8	-18.5	105.0	
2.408	2.651	294.3	9.8	118.0	2.136	2.669	275.0	-21.1	102.7	
2.413	2.659	286.6	9.7	110.5	2.147	2.672	271.8	-23.2	104.6	
2.411	2.671	280.0	8.0	107.2	2.161	2.685	270.6	-22.1	107.6	
2.397	2.675	272.4	7.5	88.4	2.159	2.669	272.0	-22.3	108.3	
2.376	2.672	266.0	8.3	85.6	2.152	2.664	275.7	-22.9	108.6	
2.374	2.674	256.3	8.2	104.1	2.162	2.666	281.1	-21.2	108.4	
2.365	2.675	259.9	6.8	98.3	2.167	2.664	283.3	-18.6	106.4	
2.347	2.667	261.5	2.8	116.3	2.161	2.655	282.9	-16.7	105.1	
2.331	2.655	272.4	1.2	144.9	2.177	2.666	285.4	-13.9	105.1	
2.341	2.656	288.3	2.1	169.3	2.203	2.671	283.9	-10.9	106.9	
2.345	2.655	304.6	4.8	198.3	2.198	2.674	277.2	-10.4	107.2	
2.352	2.646	316.8	6.6	214.0	2.191	2.676	277.2	-10.6	107.4	
2.369	2.646	319.3	7.9	218.3	2.198	2.679	277.6	-13.3	105.5	
2.394	2.648	314.7	6.3	217.1	2.190	2.672	275.9	-17.0	102.0	
2.382	2.641	299.1	3.6	203.9	2.168	2.667	275.3	-21.5	97.6	
2.374	2.640	280.7	.9	193.4	2.166	2.654	278.6	-20.2	101.5	
2.368	2.644	261.5	5.4	181.2	2.168	2.651	275.7	-15.4	106.5	
2.349	2.645	248.0	4.2	173.7	2.165	2.647	273.5	-13.3	109.5	
2.312	2.640	237.0	3.9	171.6	2.166	2.646	272.0	-11.8	110.4	
2.297	2.640	239.7	6.8	164.3	2.173	2.650	272.7	-9.7	109.8	
2.273	2.636	256.8	5.9	161.8	2.181	2.651	274.9	-12.4	105.7	
2.253	2.621	283.0	-5.1	173.2	2.184	2.650	281.2	-18.8	102.9	
2.257	2.621	305.0	-5.7	187.1	2.177	2.650	287.5	-17.3	105.5	
2.263	2.626	314.7	-4.8	195.1	2.175	2.648	291.5	-16.5	110.0	
2.258	2.619	314.5	-5.7	198.6	2.164	2.643	288.7	-15.9	112.1	
2.269	2.621	303.9	-5.3	196.0	2.153	2.637	284.4	-17.6	111.2	
2.261	2.632	284.0	-1.1	184.5	2.147	2.641	277.7	-17.6	107.1	
2.239	2.629	268.0	-4.4	164.3	2.142	2.638	269.2	-17.4	100.3	
2.224	2.624	261.0	-2.7	143.5	2.135	2.634	261.5	-18.8	92.4	
2.220	2.630	259.2	-3.6	130.4	2.138	2.632	260.1	-19.4	88.6	
2.204	2.622	259.4	-7.1	120.3	2.131	2.642	264.3	-21.1	82.8	
2.198	2.608	264.5	-11.0	116.0	2.120	2.635	276.5	-20.6	84.0	
2.199	2.608	270.1	-10.7	113.2	2.124	2.632	277.9	-22.9	96.1	
2.189	2.607	277.8	-13.0	112.8	2.133	2.631	268.1	-19.2	106.7	
2.180	2.601	283.9	-17.6	113.0	2.139	2.627	258.7	-17.7	103.7	

(Continued)

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Table 3 (Continued)

Test No. 41: 10-deg yaw angle										
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N	
2.604	2.642	258.4	20.6	84.6	2.468	2.600	268.3	-23.9	77.1	Approach
2.581	2.633	259.3	16.2	78.5	2.455	2.596	267.8	-29.2	75.2	
2.568	2.621	260.5	15.4	79.2	2.462	2.604	272.5	-26.8	78.5	Approach
2.573	2.615	272.9	17.5	85.8	2.451	2.593	277.0	-25.9	79.0	
2.566	2.611	296.7	15.4	92.7	2.433	2.579	279.1	-26.3	80.2	Approach
2.563	2.603	301.4	15.9	105.9	2.438	2.584	282.1	-26.2	81.3	
2.572	2.604	291.6	16.8	103.5	2.442	2.579	283.4	-22.7	81.3	Approach
2.553	2.598	272.5	16.8	101.6	2.428	2.574	281.1	-21.8	80.4	
2.546	2.599	244.4	13.7	91.7	2.434	2.587	276.9	-19.3	80.9	Approach
2.540	2.599	223.5	10.9	87.2	2.444	2.589	273.9	-19.6	79.4	
2.502	2.595	214.4	5.6	73.5	2.430	2.585	270.3	-19.5	74.7	Approach
2.484	2.501	222.2	5.6	80.9	2.426	2.592	271.2	-18.1	73.3	
2.505	2.601	249.4	8.0	87.7	2.436	2.596	275.7	-16.9	74.2	Approach
2.521	2.593	287.3	8.6	102.3	2.430	2.588	278.6	-18.4	75.9	
2.545	2.591	322.6	13.4	116.3	2.436	2.595	277.5	-15.6	82.0	Approach
2.602	2.598	347.2	20.0	127.6	2.438	2.600	277.0	-12.7	88.6	
2.625	2.589	350.5	21.9	129.5	2.443	2.595	274.6	-14.0	87.9	Approach
2.619	2.587	325.3	17.5	121.9	2.448	2.594	272.4	-16.6	83.9	
2.604	2.595	289.1	16.5	109.0	2.448	2.592	271.8	-17.1	81.1	Approach
2.576	2.598	252.2	13.9	93.1	2.440	2.585	273.4	-18.6	76.6	
2.528	2.592	223.4	10.7	86.7	2.449	2.584	275.9	-13.7	78.0	Approach
2.513	2.584	212.6	7.8	86.5	2.449	2.582	280.9	-19.3	84.1	
2.498	2.590	224.6	11.8	94.6	2.451	2.580	281.0	-18.9	87.0	Approach
2.501	2.585	248.0	15.1	105.2	2.462	2.587	280.5	-16.3	89.1	
2.534	2.591	279.2	16.2	119.9	2.462	2.593	281.4	-14.8	90.8	Approach
2.573	2.595	310.9	19.2	129.5	2.444	2.587	279.3	-14.8	86.7	
2.598	2.604	330.1	22.1	138.3	2.437	2.587	275.9	-15.6	81.6	Approach
2.624	2.609	336.1	24.0	144.2	2.442	2.590	274.2	-14.3	80.4	
2.641	2.614	329.4	27.2	148.4	2.436	2.582	271.0	-13.7	80.2	Approach
2.624	2.615	307.8	26.8	144.9	2.457	2.584	271.2	-16.0	80.2	
2.600	2.619	271.4	21.2	132.1	2.480	2.593	270.8	-13.7	79.5	Approach
2.576	2.634	236.9	17.7	120.0	2.482	2.601	270.8	-11.5	78.2	
2.545	2.632	212.3	13.7	104.9	2.480	2.607	270.6	-10.4	79.9	Approach
2.512	2.632	200.4	4.5	91.7	2.484	2.616	274.2	-11.8	79.0	
2.505	2.633	207.3	-1.2	91.3	2.468	2.614	275.9	-10.0	77.6	Approach
2.521	2.645	237.1	.3	103.1	2.462	2.614	280.5	-12.8	81.3	
2.542	2.639	279.3	1.2	126.4	2.469	2.612	281.3	-11.5	86.0	Approach
2.583	2.636	319.0	-2.4	147.2	2.465	2.607	280.4	-15.4	83.5	
2.620	2.639	344.1	-1.5	169.5	2.464	2.616	278.5	-17.5	80.1	Approach
2.637	2.642	351.8	4.6	181.3	2.475	2.628	277.4	-16.0	81.1	
2.622	2.627	342.0	4.3	178.2	2.475	2.629	273.2	-14.0	82.0	Approach
2.608	2.626	318.4	1.5	170.4	2.478	2.634	272.3	-18.6	79.7	
2.581	2.630	289.2	3.0	156.5	2.488	2.640	273.0	-16.3	79.7	Approach
2.545	2.636	263.9	6.0	137.8	2.493	2.634	276.7	-14.0	80.8	
2.511	2.625	244.2	2.7	122.2	2.478	2.622	278.9	-16.0	79.4	Approach
2.507	2.636	234.7	-1	112.7	2.480	2.625	280.0	-19.5	77.6	
2.491	2.641	229.9	.6	100.9	2.487	2.631	280.0	-16.5	78.3	Approach
2.475	2.634	231.3	-3.7	92.2	2.480	2.633	280.4	-15.9	75.9	
2.491	2.626	241.1	-9.6	90.3	2.470	2.635	277.6	-16.8	74.0	Approach
2.514	2.631	261.5	-11.5	92.7	2.481	2.647	275.8	-20.0	72.4	
2.513	2.621	280.0	-14.0	94.8	2.487	2.650	275.1	-18.0	69.0	Approach
2.524	2.618	293.9	-15.7	99.8	2.478	2.640	272.3	-17.8	64.3	
2.547	2.624	304.9	-11.9	108.0	2.486	2.637	270.1	-17.5	65.5	Approach
2.540	2.621	309.1	-11.8	109.2	2.502	2.640	268.4	-16.9	69.8	
2.529	2.616	302.4	-14.3	106.8	2.496	2.639	266.2	-15.4	70.9	Approach
2.523	2.626	293.1	-13.9	104.5	2.487	2.633	263.8	-16.6	69.5	
2.518	2.621	286.0	-13.6	99.7	2.482	2.638	264.5	-17.5	69.0	Approach
2.485	2.608	276.5	-19.8	89.4	2.470	2.640	262.5	-16.8	65.7	
2.477	2.607	270.9	-22.5	84.7	2.455	2.630	256.8	-18.0	63.8	Approach
2.472	2.617	269.8	-22.2	80.8	2.464	2.618	253.4	-16.9	69.5	

(Continued)

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Table 3 (Continued)

Test No. 42; 5-deg yaw angle										
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N	
2.611	2.651	295.2	17.8	111.8	2.544	2.661	257.5	-28.2	45.8	
2.662	2.686	282.0	16.3	100.1	2.544	2.661	267.4	-31.4	46.8	
2.668	2.666	277.3	20.1	99.2	2.555	2.666	280.4	-32.3	49.2	
2.653	2.660	268.0	21.0	87.8	2.553	2.659	291.9	-34.1	48.9	
2.641	2.674	247.4	19.9	81.4	2.554	2.661	299.4	-33.2	50.8	
2.623	2.675	215.8	16.0	72.9	2.571	2.674	302.2	-33.3	56.3	
2.600	2.682	215.1	13.3	73.6	2.587	2.681	298.0	-31.2	59.4	
2.599	2.691	228.2	12.3	80.7	2.582	2.676	288.4	-27.2	58.9	
2.599	2.684	252.1	11.4	92.3	2.566	2.674	276.4	-27.5	58.2	
2.611	2.679	276.7	8.1	100.2	2.571	2.685	266.7	-30.0	58.7	
2.637	2.679	301.5	9.4	109.1	2.570	2.690	262.7	-27.8	53.2	
2.675	2.684	322.4	16.2	119.6	2.565	2.690	259.3	-30.5	46.8	
2.681	2.672	329.6	18.7	123.4	2.565	2.688	263.3	-33.0	45.1	
2.680	2.669	319.9	17.7	122.2	2.590	2.693	268.1	-30.0	47.8	
2.690	2.671	300.9	23.2	122.9	2.602	2.692	274.3	-28.5	48.5	
2.672	2.671	275.1	25.7	113.2	2.592	2.685	278.0	-30.6	49.6	
2.628	2.655	254.2	19.3	103.3	2.584	2.680	285.0	-30.2	52.3	
2.606	2.658	237.6	13.6	98.9	2.593	2.690	288.2	-30.0	55.5	
2.601	2.665	237.0	12.7	98.7	2.581	2.688	289.2	-33.0	53.5	
2.574	2.655	251.5	9.9	97.1	2.569	2.677	286.1	-34.4	52.2	
2.586	2.652	273.6	9.0	110.1	2.571	2.679	283.2	-32.0	54.9	
2.607	2.654	294.0	11.7	122.0	2.578	2.684	278.6	-30.3	57.9	
2.625	2.656	308.1	17.4	126.5	2.569	2.671	271.0	-32.7	55.5	
2.639	2.645	308.0	20.8	125.1	2.549	2.669	264.1	-33.0	52.9	
2.662	2.650	295.5	22.5	121.5	2.552	2.668	265.1	-31.1	50.6	
2.657	2.646	281.8	22.9	110.8	2.545	2.662	270.9	-32.4	47.2	
2.656	2.642	263.7	22.6	102.7	2.531	2.651	272.9	-34.2	44.6	
2.645	2.629	255.8	20.1	97.8	2.531	2.653	274.4	-33.9	47.0	
2.644	2.631	258.1	17.4	97.6	2.548	2.654	279.5	-30.3	51.5	
2.617	2.624	264.1	12.1	98.5	2.545	2.649	279.1	-30.9	51.3	
2.603	2.624	265.8	7.5	103.3	2.553	2.652	274.9	-30.2	53.0	
2.596	2.630	272.3	6.0	104.7	2.559	2.651	274.7	-27.8	51.3	
2.592	2.632	275.1	6.0	107.1	2.561	2.651	276.2	-27.9	45.9	
2.579	2.625	272.9	3.9	106.8	2.565	2.655	279.7	-29.6	44.0	
2.579	2.628	272.8	3.1	108.4	2.567	2.665	281.0	-26.0	46.8	
2.584	2.628	278.2	5.1	108.5	2.558	2.651	282.4	-27.0	44.7	
2.586	2.627	280.8	6.4	107.5	2.553	2.650	281.6	-26.9	45.3	
2.580	2.622	282.9	3.3	106.6	2.551	2.650	282.9	-26.7	47.5	
2.580	2.634	286.3	1.6	107.7	2.540	2.641	278.5	-26.9	44.2	
2.594	2.633	286.7	2.2	105.6	2.525	2.632	275.7	-28.8	43.5	
2.601	2.630	282.9	.3	105.4	2.542	2.643	273.0	-26.0	47.5	
2.601	2.634	285.6	-3.0	106.5	2.535	2.640	271.2	-26.9	48.4	
2.595	2.641	283.0	-2.7	103.5	2.522	2.634	269.3	-27.2	48.0	
2.580	2.633	274.2	-9.9	99.9	2.532	2.634	269.3	-27.0	52.2	
2.563	2.640	264.1	3.0	94.5	2.544	2.633	273.6	-26.1	53.2	
2.550	2.639	258.2	3.6	84.2	2.517	2.619	275.6	-31.2	49.6	
2.525	2.634	249.0	-4	71.7	2.524	2.625	282.0	-31.7	50.8	
2.530	2.649	251.1	-5.2	65.5	2.538	2.625	285.4	-29.3	52.7	
2.545	2.656	265.2	-10.2	60.3	2.519	2.624	283.8	-29.6	51.6	
2.546	2.651	285.9	-20.7	57.9	2.517	2.626	278.2	-32.1	51.8	
2.553	2.656	303.5	-27.8	59.9	2.537	2.643	277.1	-28.2	53.0	
2.585	2.666	315.6	-25.0	66.7	2.536	2.639	273.1	-28.2	50.1	
2.591	2.654	316.5	-24.0	67.9	2.522	2.639	268.7	-28.2	49.7	
2.586	2.649	306.1	-24.7	67.4	2.539	2.645	273.5	-26.1	52.9	
2.593	2.655	289.8	-21.6	67.4	2.535	2.645	279.3	-24.9	51.8	
2.592	2.666	273.9	-16.6	64.4	2.536	2.636	281.1	-26.0	50.3	
2.572	2.661	260.3	-18.1	57.0	2.554	2.651	280.9	-21.1	53.7	
2.560	2.666	252.2	-20.4	52.7	2.565	2.665	275.3	-16.2	56.7	
2.566	2.678	252.3	-20.7	51.5	2.563	2.656	257.0	-13.3	54.4	
2.556	2.676	255.0	-23.1	47.7	2.565	2.653	241.0	-7.5	56.0	

(Continued)

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Table 3 (Continued)

Test No. 43; 15-deg yaw angle										
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N	
1.213	1.278	276.9	5.9	81.0	1.230	1.361	277.6	-9.0	136.7	
1.242	1.304	280.5	6.4	82.1	1.227	1.359	281.1	-9.8	134.6	
1.252	1.321	286.8	6.0	84.3	1.235	1.347	281.7	-7.3	136.1	
1.259	1.329	278.5	6.6	92.5	1.219	1.337	277.2	-10.2	133.7	
1.258	1.330	275.7	5.2	91.3	1.237	1.343	277.6	-8.2	134.6	
1.255	1.332	268.9	5.6	83.9	1.223	1.334	275.3	-10.0	133.0	
1.246	1.330	268.1	6.9	87.8	1.232	1.344	277.0	-9.0	137.1	
1.252	1.330	269.2	8.3	95.2	1.217	1.347	276.2	-10.3	136.3	
1.252	1.336	275.3	6.3	84.8	1.230	1.356	280.4	-9.2	141.3	
1.258	1.339	279.8	9.0	81.4	1.213	1.347	279.5	-10.4	139.6	
1.261	1.345	283.0	10.3	92.3	1.227	1.362	279.8	-9.8	141.7	
1.262	1.346	272.7	9.6	91.7	1.210	1.347	276.0	-10.8	136.2	
1.270	1.351	267.2	9.6	79.4	1.224	1.359	277.6	-10.1	137.7	
1.271	1.350	267.5	11.8	81.6	1.218	1.351	276.0	-10.0	134.2	
1.277	1.357	279.9	12.0	94.0	1.221	1.356	276.0	-10.1	134.7	
1.275	1.347	283.7	10.2	93.7	1.210	1.347	276.2	-9.9	132.9	
1.279	1.350	286.5	13.1	89.4	1.221	1.359	279.5	-9.3	134.9	
1.268	1.352	279.8	9.2	87.8	1.208	1.356	281.5	-12.0	131.4	
1.275	1.354	275.0	7.5	89.1	1.213	1.365	285.2	-10.9	131.9	
1.275	1.347	268.9	7.1	86.0	1.216	1.362	279.4	-9.9	132.7	
1.277	1.353	271.2	8.2	84.4	1.219	1.360	275.0	-9.5	131.2	
1.279	1.347	273.6	3.0	80.7	1.215	1.355	273.0	-10.4	131.2	
1.289	1.344	277.8	5.5	86.8	1.228	1.354	274.3	-8.2	132.7	
1.278	1.338	274.3	6.9	87.4	1.226	1.352	273.3	-8.9	134.3	
1.274	1.341	274.1	6.0	84.4	1.227	1.356	279.1	-11.2	133.2	
1.273	1.341	275.6	4.9	82.0	1.231	1.361	283.4	-10.1	136.6	
1.278	1.348	276.6	8.2	94.3	1.236	1.368	282.4	-10.1	138.1	
1.273	1.347	273.1	8.6	98.7	1.238	1.370	278.6	-9.6	133.7	
1.274	1.350	275.2	9.0	101.1	1.235	1.367	275.9	-11.3	134.9	
1.276	1.344	271.7	10.6	111.1	1.242	1.373	275.9	-8.3	136.9	
1.280	1.341	267.0	12.9	130.9	1.244	1.373	276.6	-9.9	133.7	
1.264	1.333	271.1	12.0	144.6	1.241	1.367	279.2	-12.0	131.4	
1.270	1.339	279.7	12.9	162.7	1.231	1.363	280.5	-11.6	128.2	
1.268	1.335	277.9	11.6	175.4	1.229	1.360	280.4	-11.6	126.4	
1.274	1.347	275.9	11.0	180.7	1.221	1.355	279.2	-13.8	123.4	
1.276	1.351	278.6	9.3	180.3	1.215	1.355	277.5	-13.8	122.4	
1.289	1.353	276.5	9.8	180.6	1.223	1.355	277.5	-11.2	124.0	
1.280	1.348	276.3	8.7	177.2	1.225	1.359	278.3	-13.1	124.8	
1.277	1.347	279.4	8.6	179.1	1.229	1.364	278.5	-12.0	127.8	
1.275	1.342	279.2	7.7	184.4	1.227	1.364	278.5	-13.2	127.4	
1.260	1.335	276.6	6.9	138.4	1.224	1.361	278.9	-13.8	127.9	
1.261	1.342	278.8	7.2	190.8	1.218	1.362	280.8	-16.6	125.4	
1.256	1.345	275.4	3.8	188.6	1.213	1.359	277.0	-15.5	125.5	
1.258	1.356	275.3	2.1	181.7	1.217	1.362	272.8	-15.3	124.3	
1.249	1.356	278.2	-1.1	169.9	1.222	1.359	270.5	-15.6	120.5	
1.261	1.367	280.5	-8	160.5	1.228	1.361	272.5	-17.4	117.0	
1.235	1.359	277.9	-6.2	148.0	1.232	1.360	273.6	-14.6	118.0	
1.234	1.355	280.4	-4.9	141.5	1.234	1.363	275.7	-17.1	116.5	
1.217	1.349	278.1	-8.2	137.3	1.226	1.360	279.8	-18.9	115.7	
1.215	1.353	277.8	-7.9	136.9	1.224	1.360	280.7	-18.1	116.7	
1.205	1.348	275.3	-9.9	135.3	1.228	1.362	279.2	-17.3	118.0	
1.217	1.352	276.3	-9.2	135.7	1.223	1.360	276.5	-18.3	112.5	
1.218	1.353	275.6	-11.0	136.6	1.221	1.357	275.0	-18.1	110.8	
1.222	1.350	277.2	-9.4	137.6	1.224	1.358	275.7	-17.0	109.0	
1.218	1.345	278.1	-11.0	139.2	1.221	1.354	277.8	-18.8	109.0	
1.215	1.344	278.8	-10.6	139.7	1.229	1.360	279.5	-16.2	114.5	
1.217	1.344	274.6	-9.7	140.6	1.229	1.356	277.8	-13.6	123.5	
1.216	1.347	273.1	-10.5	138.8	1.240	1.363	278.8	-12.7	131.7	
1.227	1.356	276.0	-8.3	138.6	1.240	1.357	271.0	-8.2	136.3	
1.224	1.356	275.6	-8.7	136.9	1.243	1.365	257.2	-4.1	135.1	

(Continued)

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Table 3 (Continued)

Test No. 44; 25-deg yaw angle										
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N	
1.097	1.284	288.6	9.9	62.3	1.090	1.375	274.7	1.2	82.5	
1.102	1.310	287.1	9.7	54.4	1.083	1.366	275.3	-0.5	79.6	
1.114	1.331	288.7	10.0	42.8	1.088	1.367	279.2	.2	83.4	
1.128	1.339	285.1	10.7	38.0	1.090	1.367	281.7	-0.3	84.9	
1.125	1.343	281.1	9.6	49.3	1.095	1.375	281.9	-0.0	87.3	
1.132	1.353	275.7	12.8	55.2	1.090	1.373	279.2	-1.9	88.0	
1.124	1.345	268.3	12.7	44.8	1.097	1.380	280.2	-0.3	91.5	
1.118	1.348	261.6	13.2	47.9	1.089	1.356	278.8	.3	90.5	
1.108	1.348	264.5	13.5	52.0	1.079	1.358	273.4	-0.0	89.9	
1.128	1.355	271.6	14.8	56.9	1.088	1.356	271.3	1.8	89.3	
1.127	1.348	280.1	11.8	54.5	1.088	1.356	270.0	1.4	86.3	
1.154	1.353	286.4	15.1	56.0	1.083	1.355	269.3	1.1	84.3	
1.159	1.348	285.5	13.4	60.5	1.084	1.380	271.8	1.4	85.0	
1.160	1.352	282.1	14.3	62.9	1.089	1.381	277.9	2.0	87.9	
1.157	1.351	279.2	14.5	57.5	1.081	1.378	282.9	1.2	89.6	
1.145	1.353	275.3	13.4	48.5	1.089	1.381	288.0	2.8	94.6	
1.146	1.359	274.1	15.1	54.7	1.094	1.378	284.9	3.0	95.6	
1.152	1.361	275.6	12.4	57.4	1.099	1.378	279.8	1.9	94.6	
1.167	1.368	273.2	12.4	57.8	1.099	1.375	275.6	2.1	90.3	
1.161	1.363	272.4	12.8	46.4	1.090	1.375	274.4	2.2	90.1	
1.179	1.369	274.8	17.1	51.4	1.078	1.369	273.7	1.5	87.3	
1.179	1.365	276.9	13.1	57.2	1.074	1.374	278.1	1.3	88.6	
1.187	1.366	280.2	16.8	64.8	1.073	1.375	281.3	1.3	90.3	
1.171	1.358	281.6	14.8	57.3	1.080	1.374	283.6	1.1	92.6	
1.176	1.362	277.0	16.0	56.7	1.098	1.378	282.6	2.1	91.9	
1.155	1.360	272.1	15.0	61.5	1.091	1.376	278.6	.4	91.4	
1.169	1.363	272.4	16.7	70.9	1.086	1.372	276.7	.9	90.5	
1.157	1.361	272.8	15.4	69.3	1.081	1.366	275.6	.2	88.4	
1.174	1.366	277.0	20.6	72.3	1.087	1.371	274.8	.6	89.3	
1.174	1.369	277.3	20.3	84.1	1.081	1.367	275.9	.3	88.9	
1.183	1.369	276.9	21.4	96.9	1.096	1.376	280.1	2.2	89.8	
1.168	1.363	272.1	18.7	98.3	1.089	1.375	280.7	1.7	89.1	
1.173	1.369	271.1	22.5	106.1	1.090	1.381	282.0	3.0	90.8	
1.157	1.366	270.2	18.3	120.7	1.078	1.377	280.4	.6	88.1	
1.157	1.366	277.2	18.6	135.7	1.086	1.381	281.6	1.4	90.6	
1.146	1.361	282.1	15.6	138.4	1.079	1.373	280.7	1.0	89.8	
1.150	1.365	285.5	19.7	140.0	1.100	1.381	277.8	1.1	94.5	
1.142	1.362	281.7	16.4	140.0	1.101	1.378	276.2	1.1	93.3	
1.134	1.360	279.2	16.5	139.9	1.106	1.381	277.3	2.1	95.6	
1.120	1.360	276.9	12.9	133.6	1.097	1.375	274.8	1.2	96.3	
1.117	1.361	275.4	14.5	130.9	1.104	1.383	277.0	.6	100.1	
1.100	1.360	273.8	10.7	125.2	1.100	1.381	282.4	.7	97.6	
1.094	1.359	274.1	10.1	119.7	1.105	1.382	281.3	.8	101.4	
1.097	1.359	273.1	8.3	114.9	1.109	1.379	283.0	3.2	103.0	
1.097	1.354	271.8	10.5	113.2	1.106	1.379	280.1	2.6	98.4	
1.100	1.357	276.2	10.3	116.4	1.112	1.381	275.0	4.4	95.4	
1.112	1.354	279.5	10.1	121.0	1.105	1.376	271.5	3.5	93.8	
1.108	1.355	284.5	10.4	124.1	1.102	1.379	274.1	3.8	92.4	
1.097	1.359	286.7	10.3	125.5	1.099	1.381	272.7	3.3	91.8	
1.091	1.362	284.0	9.9	124.7	1.100	1.384	277.3	4.3	96.9	
1.084	1.364	278.9	8.0	117.6	1.100	1.378	278.5	2.0	99.9	
1.079	1.367	274.0	6.2	109.6	1.102	1.384	279.2	2.6	100.1	
1.074	1.366	270.8	5.9	105.8	1.098	1.380	276.0	2.2	97.9	
1.068	1.361	271.3	4.7	102.9	1.090	1.378	275.3	.2	95.1	
1.076	1.363	277.8	3.5	101.8	1.097	1.378	273.8	-0.8	90.9	
1.078	1.360	280.5	1.7	99.6	1.093	1.375	275.7	-1.5	87.4	
1.083	1.363	282.7	2.6	98.3	1.096	1.375	278.1	-0.2	89.0	
1.091	1.369	279.4	-0.5	92.5	1.079	1.371	277.5	-4.0	86.3	
1.103	1.372	278.5	1.0	88.5	1.078	1.366	275.1	-1.2	86.0	
1.089	1.370	274.7	-1.5	83.5	1.064	1.361	268.7	.6	86.3	

(Continued)

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Table 3 (Continued)

Test No. 45 40-deg yaw angle										
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N	
.871	1.261	186.1	-3.5	69.2	.883	1.341	188.3	-2.2	140.1	
.886	1.284	177.3	-1.9	68.6	.871	1.335	192.7	-3.2	138.5	
.891	1.296	176.3	2.0	58.9	.857	1.334	195.0	-4.5	137.6	
.882	1.305	181.0	2.4	50.3	.861	1.335	193.0	-7.8	133.4	
.891	1.320	184.6	5.8	47.3	.863	1.337	192.4	-9.2	125.6	
.895	1.318	189.2	4.6	56.9	.862	1.338	190.8	-8.2	120.6	
.891	1.317	192.2	3.7	56.0	.846	1.333	189.6	-10.2	112.9	
.897	1.329	194.9	3.7	55.3	.848	1.334	188.1	-7.6	111.0	
.912	1.334	190.3	2.6	59.4	.843	1.334	189.0	-6.7	111.7	
.920	1.330	189.2	.8	62.7	.838	1.332	189.6	-7.3	116.0	
.924	1.331	187.5	1.2	59.0	.844	1.334	188.7	-10.2	117.7	
.934	1.330	193.8	4.3	57.8	.855	1.335	185.9	-9.3	119.8	
.928	1.321	198.1	2.2	61.2	.864	1.343	185.4	-10.0	121.1	
.935	1.323	204.1	2.8	67.2	.864	1.346	186.2	-11.0	118.1	
.937	1.326	195.3	2.9	68.4	.857	1.346	185.5	-11.9	113.1	
.937	1.326	189.0	4.9	66.2	.849	1.345	187.8	-8.3	110.0	
.925	1.328	185.2	4.4	58.7	.837	1.348	189.7	-9.2	108.3	
.924	1.336	182.9	3.3	54.5	.834	1.343	193.0	-8.7	105.8	
.913	1.331	180.4	3.6	55.7	.829	1.340	192.8	-9.8	106.1	
.925	1.331	178.9	4.3	55.6	.835	1.347	191.6	-4.8	111.2	
.932	1.337	183.5	3.0	52.4	.838	1.351	187.3	-7.3	113.3	
.936	1.334	188.0	1.4	49.8	.839	1.343	184.3	-7.7	113.8	
.946	1.333	189.9	4.0	61.1	.839	1.343	183.3	-9.5	113.6	
.956	1.343	194.9	5.0	68.1	.839	1.342	181.8	-8.5	112.8	
.944	1.340	200.7	3.0	67.5	.840	1.338	185.6	-12.3	111.3	
.942	1.334	199.5	6.3	61.4	.830	1.335	188.7	-10.7	110.4	
.951	1.335	192.1	8.5	63.2	.836	1.340	193.0	-10.5	111.8	
.936	1.326	186.8	5.3	64.6	.823	1.337	191.6	-10.3	110.6	
.932	1.320	185.5	5.2	66.7	.815	1.332	190.6	-10.4	108.1	
.931	1.323	190.3	5.9	73.4	.818	1.334	188.7	-7.4	106.1	
.917	1.324	185.6	3.8	88.0	.829	1.334	187.1	-13.9	100.3	
.916	1.330	184.9	2.8	109.5	.830	1.336	185.4	-11.7	96.2	
.928	1.333	184.2	4.6	126.7	.831	1.334	184.0	-13.1	92.8	
.929	1.333	184.9	4.7	135.6	.835	1.339	187.3	-12.3	94.1	
.935	1.333	185.5	9.5	141.6	.830	1.337	189.6	-16.3	93.3	
.942	1.327	191.5	12.6	148.9	.826	1.338	193.4	-10.7	97.2	
.936	1.321	194.3	15.4	156.0	.820	1.340	190.9	-11.3	99.3	
.932	1.327	193.5	17.1	157.8	.824	1.340	193.0	-11.7	100.1	
.920	1.326	187.5	17.6	156.9	.829	1.343	192.5	-12.8	100.8	
.915	1.327	183.3	13.6	153.4	.814	1.339	186.8	-11.4	99.9	
.920	1.333	181.7	10.8	157.1	.810	1.336	184.6	-11.9	99.8	
.922	1.333	182.1	9.4	161.7	.817	1.337	189.2	-11.5	101.5	
.919	1.330	188.0	9.6	167.5	.828	1.334	187.0	-11.1	103.8	
.920	1.331	194.0	8.1	168.2	.834	1.339	186.1	-9.4	106.7	
.921	1.328	196.5	9.6	173.1	.844	1.343	188.3	-11.6	107.0	
.913	1.325	198.2	10.6	175.6	.852	1.349	186.8	-10.8	107.4	
.908	1.330	198.2	9.6	176.3	.847	1.351	184.9	-13.7	105.9	
.898	1.329	192.2	6.9	172.2	.822	1.355	185.5	-15.0	103.2	
.898	1.332	185.6	8.2	171.4	.811	1.354	185.6	-15.7	99.4	
.888	1.334	181.8	6.6	167.8	.811	1.351	187.7	-13.4	97.6	
.893	1.335	179.2	5.6	165.4	.802	1.352	190.0	-15.1	95.2	
.902	1.339	182.9	9.0	169.0	.792	1.349	191.5	-15.0	92.4	
.902	1.335	187.4	8.4	172.8	.803	1.357	190.5	-12.3	96.1	
.903	1.332	192.1	7.5	174.4	.798	1.351	191.1	-14.8	96.9	
.912	1.340	194.3	7.5	177.2	.784	1.351	186.7	-16.9	98.9	
.898	1.337	192.2	6.3	174.6	.784	1.349	183.6	-15.4	102.1	
.895	1.339	187.0	1.8	165.5	.790	1.346	180.1	-14.9	103.7	
.903	1.343	183.7	.1	126.2	.792	1.343	180.7	-16.5	103.0	
.895	1.342	183.3	.7	149.6	.797	1.346	178.0	-15.6	99.4	
.881	1.337	183.3	-.3	142.6	.801	1.346	181.8	-13.7	95.3	

(Continued)

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Table 3 (Continued)

Test No. 46; 65-deg yaw angle										
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N	
.408	1.157	172.3	4.3	49.8	.378	1.288	181.7	-8.1	138.3	
.430	1.218	174.2	2.0	53.2	.349	1.279	182.4	-10.8	134.6	
.426	1.224	171.6	1.6	62.1	.339	1.284	187.6	-9.6	133.7	
.410	1.220	178.9	1.8	55.4	.333	1.289	176.6	-9.7	134.8	
.390	1.209	180.5	-1.9	55.1	.308	1.285	178.5	-13.7	134.0	
.385	1.206	184.3	-4.5	53.5	.300	1.285	185.0	-12.5	136.9	
.395	1.215	187.3	4.9	51.1	.310	1.295	192.0	-11.3	141.4	
.409	1.219	187.9	6.3	51.7	.303	1.283	185.6	-12.0	143.6	
.429	1.233	180.2	5.9	57.2	.310	1.288	187.3	-10.4	148.8	
.449	1.241	178.3	5.7	65.6	.318	1.293	193.2	-9.0	153.0	
.456	1.249	183.3	4.7	67.6	.320	1.288	192.9	-4.7	155.8	
.446	1.243	176.6	2.4	60.7	.324	1.288	184.4	-4.3	160.2	
.435	1.241	174.5	2.7	50.6	.331	1.290	179.6	-6.9	162.4	
.420	1.235	178.5	4.2	45.2	.342	1.291	183.1	-6.8	165.4	
.404	1.236	184.1	4.6	49.3	.357	1.291	183.9	-5.0	168.5	
.400	1.234	178.3	3.8	57.0	.371	1.294	180.8	-9.8	169.9	
.402	1.237	180.6	3.1	61.6	.379	1.293	182.0	-10.0	170.6	
.399	1.242	186.2	5.6	58.4	.381	1.293	189.5	-9.5	170.7	
.393	1.245	188.4	5.1	54.1	.378	1.296	200.0	-9.2	167.8	
.399	1.243	183.7	6.4	55.2	.360	1.294	198.0	-9.9	165.4	
.417	1.249	180.4	6.4	63.8	.340	1.294	193.0	-10.9	160.2	
.429	1.253	184.6	5.2	75.0	.332	1.301	196.1	-10.3	154.7	
.445	1.256	180.1	6.2	84.8	.309	1.301	196.1	-10.4	148.9	
.449	1.251	183.1	5.5	86.1	.297	1.300	183.6	-10.7	147.8	
.439	1.253	187.3	6.9	87.1	.296	1.305	179.0	-12.3	146.2	
.428	1.254	199.7	11.4	91.6	.280	1.301	182.5	-14.1	144.7	
.423	1.251	195.4	13.2	95.7	.276	1.296	187.1	-12.5	145.1	
.412	1.254	193.9	10.5	104.2	.290	1.301	185.0	-12.3	147.0	
.419	1.251	190.0	9.4	114.5	.284	1.293	183.3	-13.6	143.3	
.442	1.256	187.8	9.3	119.8	.292	1.293	189.8	-14.2	143.1	
.460	1.259	181.5	8.2	115.3	.308	1.295	191.9	-10.9	144.5	
.453	1.246	134.1	5.9	115.1	.308	1.286	184.3	-12.3	145.2	
.445	1.240	181.1	5.4	119.3	.316	1.293	181.2	-12.1	148.1	
.444	1.252	181.2	7.0	127.3	.312	1.295	184.9	-13.0	150.3	
.430	1.258	182.2	7.8	132.5	.302	1.294	183.3	-9.6	152.3	
.411	1.251	181.1	5.2	136.3	.300	1.302	182.0	-11.9	156.1	
.403	1.253	179.5	5.8	137.4	.283	1.303	178.6	-13.0	156.7	
.413	1.266	185.6	8.4	140.6	.279	1.301	182.1	-12.4	159.1	
.409	1.265	191.9	8.6	143.1	.287	1.306	188.1	-10.1	163.6	
.400	1.259	185.9	5.1	142.3	.288	1.298	189.4	-11.7	166.2	
.393	1.259	189.1	5.4	145.9	.295	1.294	185.7	-9.8	166.2	
.403	1.270	191.4	6.2	153.8	.305	1.297	191.1	-9.9	166.7	
.407	1.273	188.9	5.6	156.9	.296	1.293	191.4	-10.6	163.5	
.412	1.271	185.0	3.9	160.0	.298	1.292	185.7	-12.3	159.0	
.425	1.273	186.0	4.2	164.9	.298	1.298	180.8	-11.6	154.9	
.429	1.273	189.5	3.0	166.5	.284	1.298	179.5	-15.4	150.5	
.436	1.271	185.7	2.1	164.4	.288	1.303	182.1	-15.5	146.6	
.427	1.271	183.3	1.2	166.8	.282	1.302	184.6	-13.1	144.8	
.417	1.271	178.0	.1	165.5	.264	1.300	180.2	-14.1	144.6	
.400	1.271	182.1	-.3	163.4	.260	1.307	184.3	-17.0	146.6	
.394	1.278	176.9	1.1	162.7	.241	1.301	188.1	-13.2	143.6	
.374	1.278	177.0	1.2	161.6	.223	1.297	188.8	-12.8	142.3	
.359	1.270	172.8	-2.8	157.2	.216	1.298	179.8	-15.0	141.9	
.366	1.278	183.1	-.6	155.8	.205	1.298	181.5	-14.5	136.2	
.368	1.282	194.8	-1.2	153.4	.203	1.298	185.2	-9.7	126.8	
.347	1.269	189.5	-5.3	147.7	.191	1.302	186.5	-12.9	110.3	
.359	1.275	192.3	-6.3	146.3	.159	1.303	176.9	-14.5	89.8	
.374	1.285	197.5	-4.4	145.5	.119	1.306	183.4	-17.1	67.7	
.356	1.276	194.3	-8.7	140.6	.062	1.298	191.1	-17.6	49.1	
.365	1.276	182.0	-7.4	138.4	-.000	1.291	191.7	-20.4	35.0	

(Continued)

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Table 3 (Continued)

Test No. 47; 85-deg yaw angle										
V _w	V _c	W	B	S	V _w	V _c	W	B	S	
m/sec	m/sec	N	N	N	m/sec	m/sec	N	N	N	
Approach	-.016	1.143	178.0	.2	41.9	.025	1.295	188.4	3.7	221.2
	-.011	1.223	183.7	5.7	41.1	.033	1.301	190.3	6.4	225.4
	-.002	1.238	188.2	9.4	47.4	.030	1.300	190.3	5.0	227.4
	.013	1.250	195.9	12.9	52.7	.016	1.298	187.5	2.9	227.1
	.030	1.257	198.3	15.1	60.4	.028	1.308	188.4	3.1	231.3
	.036	1.258	199.5	17.1	67.6	.027	1.306	188.4	1.7	232.3
	.035	1.252	195.0	14.6	70.3	.021	1.300	187.2	.2	234.1
	.022	1.249	192.6	12.8	64.3	.035	1.311	190.0	1.0	237.6
	.004	1.242	186.6	7.7	55.8	.028	1.306	187.5	-1.3	237.5
	-.012	1.231	187.9	7.5	51.4	.023	1.300	187.9	-3.2	236.8
	-.025	1.224	185.7	8.9	52.1	.024	1.307	190.4	-1.6	240.0
	-.028	1.222	185.0	8.9	54.6	.019	1.304	191.5	-3.0	240.7
	-.023	1.222	184.6	10.7	57.1	.008	1.299	188.1	-2.1	242.6
	-.021	1.222	187.5	13.4	58.8	.012	1.302	189.4	-2.1	248.4
	-.020	1.227	187.4	12.7	56.9	.004	1.301	188.1	-1.9	250.6
	-.011	1.234	188.5	9.8	56.3	.003	1.304	187.2	-1.8	250.0
	-.008	1.238	191.0	10.4	58.8	.004	1.310	185.5	.0	249.8
	-.007	1.240	191.6	7.8	62.5	-.006	1.306	184.9	-2.9	248.0
	-.003	1.244	192.6	8.5	65.2	.004	1.315	187.2	-1.4	246.7
	-.007	1.242	192.6	9.9	64.7	-.004	1.309	186.0	-1.5	242.2
	-.009	1.242	193.1	9.0	60.3	-.005	1.311	184.9	-1.5	242.1
	-.009	1.244	189.7	7.1	56.4	-.013	1.312	184.1	-4.4	241.0
	-.004	1.251	189.6	7.0	66.1	-.013	1.314	185.6	-2.3	237.4
	.003	1.257	184.4	8.5	81.3	-.013	1.314	186.3	-1.6	233.8
	.010	1.268	180.5	7.2	94.8	-.012	1.319	184.9	-1.5	232.9
	.010	1.268	184.6	10.1	110.7	-.008	1.320	186.2	-2.2	231.0
	.010	1.263	189.6	12.3	127.4	-.006	1.319	187.1	2.0	226.0
	.010	1.258	194.5	17.4	129.4	-.010	1.316	187.6	3.0	225.0
	.013	1.261	199.5	17.0	129.0	-.021	1.313	184.7	5.5	225.7
	.020	1.260	201.1	18.6	137.2	-.021	1.315	186.3	5.9	224.5
	.013	1.255	193.2	17.9	133.1	-.020	1.316	186.9	8.2	225.2
	.017	1.266	185.9	20.3	134.2	-.017	1.320	191.8	9.2	228.9
	.023	1.275	180.0	18.6	140.5	-.010	1.321	192.2	13.1	232.8
	.013	1.273	178.9	16.0	145.6	-.012	1.321	190.7	10.2	233.6
	.008	1.269	182.7	15.9	147.5	-.012	1.323	189.6	10.6	236.5
	.021	1.271	187.4	18.4	160.3	-.024	1.316	187.5	11.9	235.8
	.035	1.277	192.0	16.5	168.2	-.022	1.322	183.4	13.8	234.4
	.040	1.274	190.6	14.3	173.4	-.018	1.330	182.4	13.0	234.3
	.049	1.268	190.3	15.2	179.3	-.027	1.323	185.0	14.0	232.8
	.059	1.271	187.1	17.7	185.5	-.021	1.325	187.6	17.9	234.3
	.070	1.284	186.6	15.2	190.5	-.026	1.324	186.9	17.4	234.4
	.061	1.279	185.2	14.4	191.0	-.024	1.322	186.5	16.5	237.1
	.053	1.277	186.6	13.6	194.8	-.027	1.320	187.8	14.7	237.8
	.053	1.280	185.9	14.3	199.3	-.021	1.327	187.2	19.1	238.8
	.053	1.286	187.8	10.5	202.4	1.046	1.333	186.9	16.8	241.4
	.052	1.288	186.8	10.4	203.5	1.060	1.338	187.1	15.0	242.3
	.045	1.288	187.6	11.2	205.8	1.058	1.336	187.4	16.3	243.3
	.042	1.289	186.6	12.8	205.4	1.055	1.331	187.4	16.8	242.0
	.046	1.298	188.1	12.9	205.5	1.061	1.331	189.3	13.5	243.3
	.045	1.297	186.8	14.2	206.6	-.013	1.317	188.7	14.9	238.8
	.030	1.281	186.8	13.7	204.9	-.022	1.321	192.3	14.5	239.4
	.032	1.277	187.1	12.7	204.9	-.024	1.321	188.8	13.8	235.9
	.043	1.289	189.8	14.3	208.8	-.024	1.320	181.3	17.9	224.2
	.028	1.283	187.6	12.1	209.1	-.030	1.323	168.7	17.0	205.8
	.022	1.278	188.7	10.7	208.0	-.049	1.320	164.2	13.5	188.8
	.040	1.299	191.3	12.3	214.9	-.042	1.326	168.2	18.2	180.7
	.041	1.306	190.4	9.3	216.9	-.066	1.319	183.1	16.1	166.1
	.024	1.293	187.1	4.5	214.8	-.066	1.315	197.6	13.9	167.1
	.043	1.302	191.9	7.6	219.5	-.068	1.295	210.1	15.1	169.2
	.040	1.306	191.0	6.8	222.6	-.058	1.249	209.0	17.9	162.6

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Table 3 (Concluded)

Test No. 48 ; 90-deg yaw angle										
V _w m/sec	V _c m/sec	W N	B N	S N	V _w m/sec	V _c m/sec	W N	B N	S N	
-.025	1.193	191.8	-.9	40.2	-.036	1.308	188.1	21.7	205.4	
-.026	1.240	193.7	.9	43.5	-.040	1.301	188.1	21.8	206.4	
-.023	1.244	191.5	2.2	53.0	-.033	1.306	189.6	23.4	207.9	
-.013	1.251	192.8	1.2	52.5	-.026	1.312	190.1	22.9	210.3	
-.013	1.252	194.2	.6	50.1	-.029	1.312	189.0	22.5	212.1	
-.013	1.251	194.1	-1.2	48.5	-.029	1.308	189.3	22.0	210.3	
-.023	1.245	191.2	-5.0	49.4	-.026	1.314	189.3	21.2	208.0	
-.029	1.242	190.0	-5.2	53.0	-.025	1.315	189.0	20.4	206.7	
-.032	1.239	190.6	-4.4	54.8	-.026	1.312	189.3	19.1	203.2	
-.028	1.239	190.7	-3.1	52.4	-.021	1.318	189.3	21.4	200.7	
-.027	1.244	190.3	.1	48.4	-.021	1.324	187.9	19.6	200.7	
-.025	1.249	191.6	-.7	45.7	-.023	1.324	187.8	18.1	199.6	
-.019	1.255	192.0	-.4	46.7	-.024	1.322	187.2	19.2	199.6	
-.029	1.257	191.0	.4	49.5	-.037	1.319	185.6	18.5	200.2	
-.026	1.264	190.7	-1.1	55.0	-.036	1.317	186.9	16.1	201.3	
-.024	1.267	192.6	-.6	57.1	-.036	1.313	185.7	17.5	202.5	
-.022	1.270	191.9	.8	56.1	-.043	1.307	185.2	20.3	204.1	
-.027	1.269	191.9	-2.1	53.1	-.043	1.311	187.6	19.9	206.1	
-.029	1.263	191.5	-3.1	53.2	-.037	1.315	188.2	20.9	208.2	
-.029	1.261	191.6	-2.0	56.6	-.045	1.312	185.6	22.3	208.2	
-.023	1.263	191.2	-4.4	63.9	-.045	1.319	187.9	23.1	208.0	
-.017	1.270	183.5	-2.8	66.4	-.043	1.319	188.7	21.2	209.1	
-.016	1.272	184.7	.2	73.2	-.042	1.320	188.2	22.6	212.3	
-.009	1.276	182.7	-.6	84.4	-.041	1.320	185.9	20.5	212.4	
-.016	1.271	184.0	-.0	101.6	-.039	1.320	187.8	18.2	211.9	
-.017	1.264	187.4	4.2	116.9	-.033	1.322	188.1	20.0	213.9	
-.020	1.264	194.0	3.8	134.3	-.028	1.324	188.1	19.8	213.4	
-.012	1.269	196.9	5.2	145.9	-.028	1.324	185.9	16.9	209.5	
-.017	1.271	196.4	6.6	145.3	-.025	1.327	188.2	18.9	207.7	
-.020	1.274	191.5	6.4	137.4	-.025	1.330	188.8	20.3	208.6	
-.022	1.284	187.1	4.5	134.3	-.029	1.325	187.8	17.4	206.6	
-.028	1.278	184.6	4.9	134.4	-.029	1.330	187.9	15.7	206.0	
-.042	1.271	184.1	5.9	135.7	-.034	1.244	189.8	18.0	203.3	
-.036	1.273	188.1	6.7	144.3	-.034	1.244	188.4	16.0	203.3	
-.027	1.280	191.5	8.1	155.9	-.029	1.325	188.4	12.8	201.1	
-.028	1.278	189.8	8.9	163.7	-.034	1.325	188.4	12.8	198.0	
-.028	1.282	186.8	9.8	172.9	-.029	1.329	188.4	14.8	198.0	
-.024	1.288	186.3	10.1	182.0	-.033	1.328	187.2	10.8	198.7	
-.026	1.289	184.3	12.2	187.3	-.026	1.332	188.1	12.7	200.2	
-.037	1.286	181.2	13.4	188.7	-.030	1.328	187.8	13.1	200.1	
-.034	1.289	180.6	15.0	192.9	-.030	1.327	187.9	14.0	200.6	
-.034	1.292	183.0	17.5	196.9	-.027	1.333	189.1	13.9	202.5	
-.038	1.293	186.3	16.7	201.1	-.027	1.331	187.9	14.9	202.8	
-.029	1.297	190.7	17.9	209.2	-.024	1.338	190.1	16.3	205.5	
-.022	1.300	193.4	19.0	219.1	-.026	1.339	137.8	13.8	206.0	
-.035	1.291	192.2	19.5	222.6	-.018	1.343	188.1	15.9	209.0	
-.037	1.290	190.7	20.0	221.3	-.027	1.338	186.5	14.6	207.6	
-.023	1.303	189.3	23.4	221.9	-.055	1.344	189.6	16.3	210.6	
-.034	1.303	187.4	22.8	217.9	-.063	1.336	190.3	15.8	211.4	
-.041	1.297	184.7	20.1	207.5	-.065	1.335	191.8	21.5	211.8	
-.029	1.308	188.4	19.8	202.7	-.069	1.339	188.4	16.7	208.5	
-.025	1.312	187.2	19.1	202.4	-.069	1.338	179.9	14.8	200.1	
-.044	1.296	186.0	18.1	198.1	-.029	1.346	166.6	14.4	183.3	
-.040	1.296	186.0	18.0	196.9	-.032	1.346	158.2	10.2	161.3	
-.034	1.305	188.4	20.4	200.9	-.020	1.354	164.6	10.4	149.6	
-.044	1.297	185.7	19.2	200.8	-.032	1.349	184.3	16.1	134.6	
-.046	1.297	187.1	19.4	201.3	-.032	1.342	200.4	16.5	116.6	
-.036	1.304	186.9	18.3	202.5	-.034	1.244	211.8	5.3	93.1	
-.041	1.303	185.7	19.6	202.0	-.024	1.299	213.3	5.1	80.4	
-.040	1.303	187.1	20.1	202.8	-.027	1.221	209.9	-.2	62.9	